

19 Sizzling Notebooks

OCTOBER 1996

BYTE

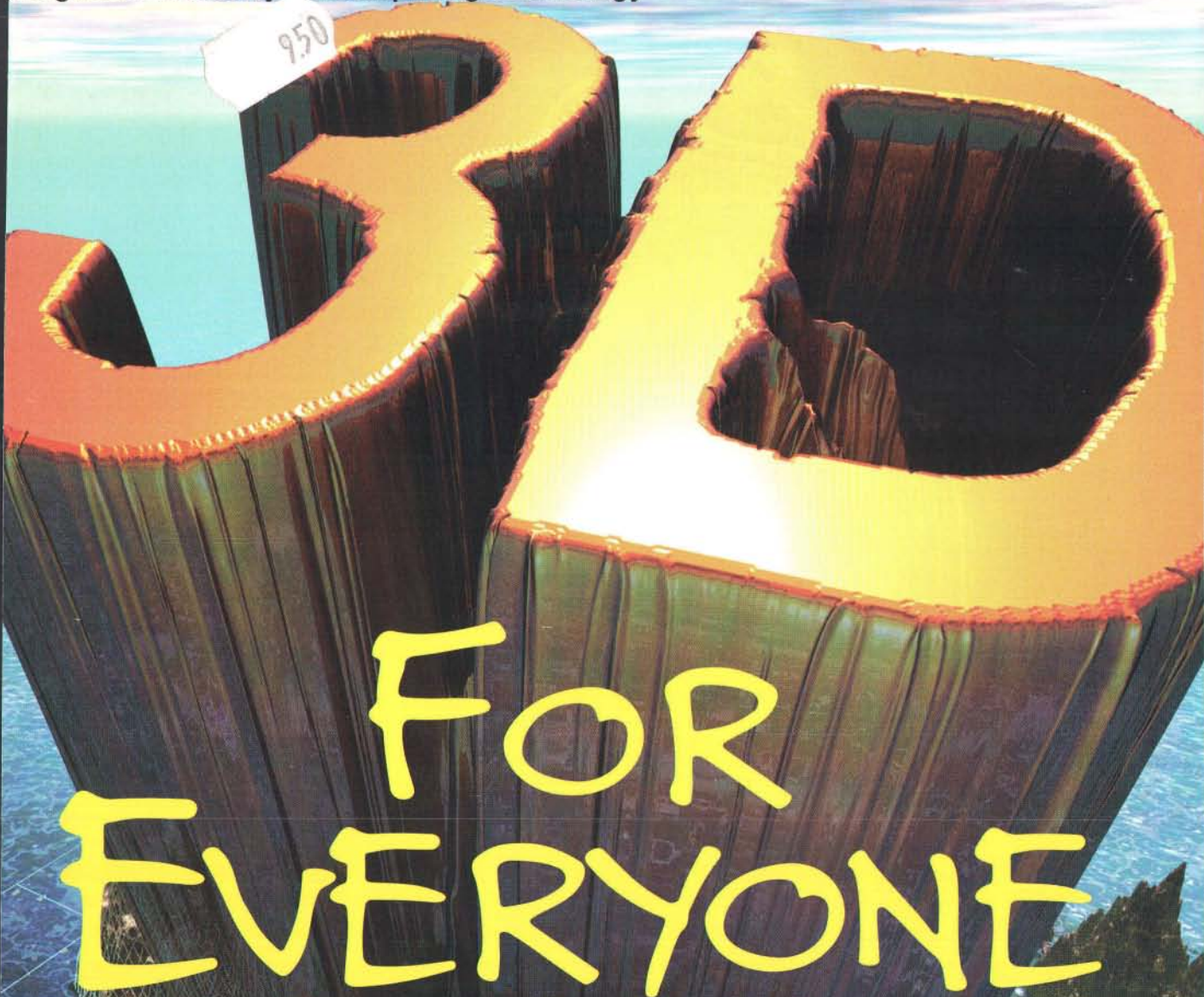
the global authority for computing technology

NT 4.0 Put to the Test p.126

HDS's Hot Web PC p.50

Everything You Need
To Know About DVD p.139

Notes: Web Winner p.49



FOR
EVERYONE

PLUS:

- How to Build Big Networks
- Euro Net Service: Choose Wisely

Europe/Middle East/Africa



9 770360 528025

U.S. \$3.50 U.S.A. / £3.00 U.K. / £3.00 U.S.A. / £3.00 U.S.A.
A Publication of The McGraw-Hill Companies/0360-5280

www.byte.com

E HAPPEN TO MAKE THEM.

liability, you really have to look inside. Micron focuses on superior engineering, from picking is outstanding performance you can count on. Micron's first-tier reliability status proves it.

RELIABILITY RANKINGS

1ST TIER



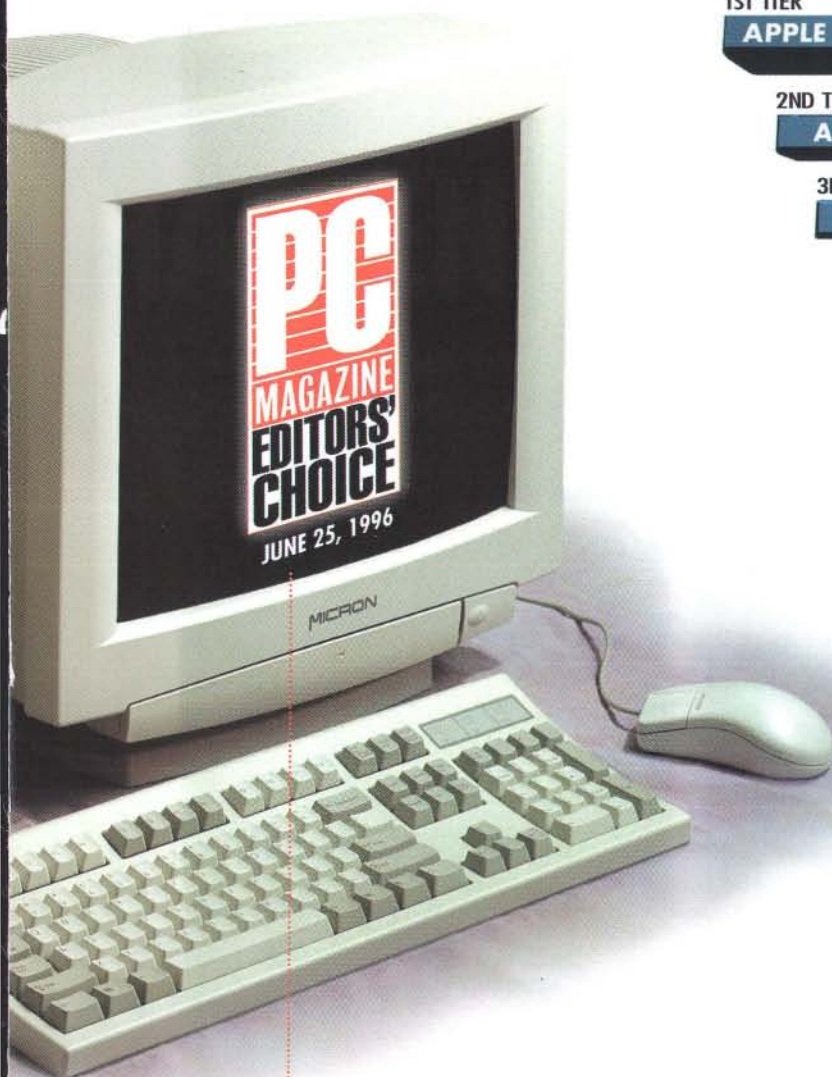
2ND TIER



3RD TIER



Source: PC World Reliability & Service Monitor, May 20 - November 20, 1995



**Micron Power™**

Warranty & Support

- 5-year limited warranty on microprocessor and main memory
- 3-year limited parts-only system warranty
- 1-2- or 3-year optional on-site service agreement for Micron desktop systems
- 30 days of free Micron-supplied software support for Micron desktop systems
- 30-day money-back policy
- 24-hour technical support

The foregoing is subject to and qualified by Micron's standard limited warranties and terms and conditions of sale. Terms and conditions of sale may vary for specific configurations. Copies of the limited warranties may be obtained on our Web site or by calling Micron.

Designed for

Microsoft®
Windows® 95


pentium
PROCESSOR

EDITORS' CHOICE AWARDS
MILLENNIA™ P166 & P133

MICRON™
ELECTRONICS, INC.

800-362-7306
<http://www.mei.micron.com>

WHAT A COINCIDENCE, W

To get an idea of how Micron Electronics™ products have achieved leadership status in the market, we put the best components available to rigorous performance and reliability tests. The results...

FAST 8X CD-ROM

**166 MHz PENTIUM®
PROCESSOR UPGRADEABLE**

**32MB ULTRA-FAST EDO RAM
UPGRADEABLE TO 128MB**

**HIGH SPEED 512KB
PIPELINE BURST CACHE**

**EIDE OR FAST SCSI-2
HARD DRIVE**

**FULL-LENGTH SLOTS
ACCESSIBLE**

MASSIVE EXPANSION BAYS

**4MB EDO HIGH RESOLUTION
3D VIDEO ADAPTER W/MPEG**

**MOST ADVANCED
INTEL 82430HX CHIPSET**

**16-BIT STEREO
SOUND AND SPEAKERS**

**TOOL-FREE CHASSIS
W/SECURITY FEATURES**

**MS WINDOWS® 95 &
MS OFFICE INSTALLED**





LOOKING FOR THE BEST PCs ON THE MARKET?



May 30, 1996
Millennia P120



June 25, 1996
Millennia P133



June 25, 1996
Millennia P166

MILLENNIA™ P166

- Intel 166MHz Pentium® processor
- 512KB pipeline burst cache, flash BIOS
- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- **PCI 64-bit 3D video with MPEG, 4MB EDO**
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- Microsoft Windows® 95 CD & MS® Plus! CD
- 5-year/3-year Micron PowerSM warranty



• **16MB EDO RAM** • 1.2GB EIDE hard drive
• 15" Micron 15FGx, .28dp (13.7" display)
• Microsoft Works 95 CD **\$1,999**
Bus. lease \$68/mo.

• **32MB EDO RAM** • 2.1GB EIDE hard drive
• 15" Micron 15FGx, .28dp (13.7" display)
• Microsoft Office Pro 95 & Bookshelf® 95 CDs **\$2,399**
Bus. lease \$82/mo.

• **64MB EDO RAM** • 3.1GB EIDE hard drive
• 17" Micron 17FGx, .26dp (15.8" display)
• Microsoft Office Pro 95 & Bookshelf 95 CDs **\$3,149**
Bus. lease \$107/mo.

With 133MHz Pentium processor subtract \$200
With 200MHz Pentium processor add \$100

MILLENNIA™ P200 PLUS

- Intel 200MHz Pentium processor
- 512KB pipeline burst cache, flash BIOS
- PCI 32-bit Ultra SCSI Fast-20 controller
- 8X SCSI CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- **PCI 64-bit 3D video with MPEG, 4MB EDO**
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 CD & MS Plus! CD
- 5-year/3-year Micron Power warranty



• **16MB EDO RAM** • 1GB Fast SCSI-2 hard drive
• 15" Micron 15FGx, .28dp (13.7" display)
• Microsoft Works 95 CD **\$2,499**
Bus. lease \$85/mo.

• **32MB EDO RAM** • 2GB Fast SCSI-2 hard drive
• 15" Micron 15FGx, .28dp (13.7" display)
• Microsoft Office Pro 95 & Bookshelf 95 CDs **\$3,199**
Bus. lease \$109/mo.

• **64MB EDO RAM** • 4GB Fast SCSI-2 hard drive
• 17" Micron 17FGx, .26dp (15.8" display)
• Microsoft Office Pro 95 & Bookshelf 95 CDs **\$4,249**
Bus. lease \$145/mo.

With 166MHz Pentium processor subtract \$100

MILLENNIA TRANSPORT™ NOTEBOOK SYSTEM

The Micron Millennium TransPort gives you no-compromise multimedia computing, long battery life and plenty of ways to customize from a variety of options.

- 133MHz Intel Mobile Pentium® processor
- Intel 430MX PCI chipset
- 256KB L2 pipeline burst cache
- 16MB EDO memory (48MB max.)
- 8X modular CD-ROM drive
- PCI graphics accelerator, 1MB EDO memory
- Pick-a-Point™ dual pointing devices integrate both pointing stick and touchpad
- Removable EIDE hard drive
- 3.5" modular floppy drive
- Intelligent modular lithium-ion battery
- 16-bit stereo sound
- Built-in stereo speakers and microphone
- 2 Type II or one Type III PCMCIA slots
- S-Video and NTSC video-outputs
- Headphone, microphone and line-in jacks
- 2 infrared ports, one front, one back
- Parallel, serial, VGA and 2 PS/2 ports
- Dimensions: 11.7" x 9.4" x 2.0", Weight: 6.9 lbs.†

- Nylon carrying case
- Microsoft® Windows® 95 and MS® Plus! CD
- Microsoft Office Pro 95 and Bookshelf® 95 CDs
- Kensington™ security lock†
- 5-year/3-year Micron PowerSM limited warranty

• 16MB EDO memory (48MB max.)
• 12.1" active matrix color display, 800 x 600
• 1.2GB removable hard drive **\$4,399**
Bus. lease \$150/mo.

• 32MB EDO memory (48MB max.)
• Motorola® Montana 28.8 fax/modem
• 12.1" active matrix color display, 800 x 600
• 1.2GB removable hard drive
• 2nd lithium-ion battery **\$5,199**
Bus. lease \$163/mo.

OPTIONS:

- With 16MB DIMM module upgrade..... add \$349
- With second 1.2GB removable hard drive..... add \$599
- With second 2.0GB removable hard drive..... add \$699
- With 150 Intel Mobile Pentium processor..... add \$200
- With 3Com® Ethernet 10BT PCMCIA..... add \$149



August 1996

Millennia TransPort P133

900 E. Karlov Road, Naperville, IL 60563 • Mon-Fri 9am-10pm Sat 7am-5pm (MT) International Sales Hours: Mon-Fri 6am-7pm (MT) • 208-893-3434

Fax 208-893-3424 • Purchase Order Fax 208-893-8992 • Technical Support Available 24 Hours / 7 Days • Technical Support E-mail: techsupport.mei@micron.com

International Sales 208-893-8970 International Fax 208-893-7393

Tollfree from Puerto Rico 800-708-1756

Tollfree from Mexico 95-800-708-1755

Tollfree from Canada 800-708-1758

MICRON™

ELECTRONICS, INC.

800-362-7306

<http://www.mei.micron.com>

©1996 Micron Electronics, Inc. All rights reserved. Micron Electronics is not responsible for omissions and/or errors in typography or photography. All purchases are subject to availability. Prices and specifications may be changed without notice; prices do not include shipping and handling. 30-day money-back policy does not include return freight and original shipping/handling charges, applies only to Micron brand products and begins from date of shipment. All sales are subject to Micron Electronics' current terms and conditions of sale. Lease prices based on 36-month lease. Intel, Intel Inside and Pentium are registered trademarks of the Intel Corporation. Microsoft, Windows, the Windows logo and Windows NT are registered trademarks of Microsoft Corporation. All other service marks, trademarks and registered trademarks are the property of their respective companies. MIL/TRNS-BYTE-9610

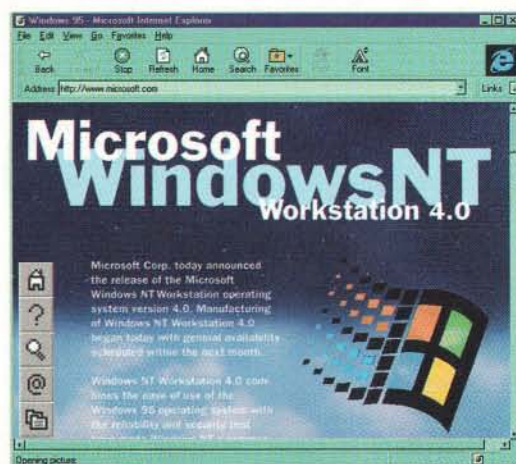
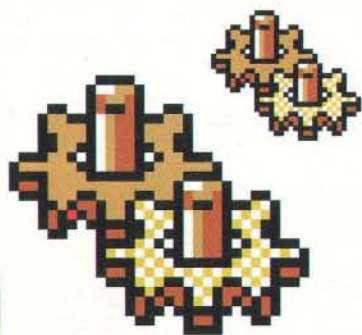
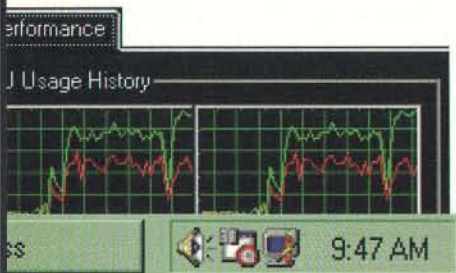
Circle 228 on Inquiry Card.

Microsoft Windows NT Workstation 4.0

has the ease of
It has the power
It has



Windows 95. of Windows NT. *computers everywhere drooling.*



The new **Windows NT® Workstation 4.0** operating system has been designed to be the most powerful desktop operating system. And because all that power is controlled by the **Windows® 95 interface**, it's much easier to use. The total **32-bit power** of Windows NT Workstation means reliability, security, and easy access to the Internet and **intranet**. It's reliable because all applications run in their own memory space—so that new game beta won't crash last week's work. It's **secure** because integrated features let you **lock your system** all the way down to the file level, so you can count on applications and data being safe.

It's Internet-ready because it's loaded with built-in features like **TCP/IP**, the **Microsoft Internet Explorer** browser, and integrated **Peer Web Services**, which lets you create a small intranet for your workgroup. And because it's all controlled by the Windows 95 interface, you can customize your system to work and look however you like. So does all this mean Windows 95 is history? Absolutely not. Windows 95 may still be your best choice, depending on your existing hardware and applications. We suggest you dive headfirst into our Web site to compare and contrast operating systems to see which 32-bit desktop is best for you.

Microsoft®

Where do you want to go today?™ www.microsoft.com/ntworkstation/

for EVERYONE

76

By Udo Flohr

Coming soon to a screen near you: low-cost 3-D graphics. But first, some technical difficulties.

International

48IS 1

EDITORIAL

Wanted: New Software

14

By Mark Schlack

HTML converters for five-year-old applications: Is this the best we can hope for?

INBOX

19

BYTE readers write about new server architectures, Windows NT issues, MMX programming, and "free PCs."

BITS

Tech-Support Software 26

New Face of Security 30



Aerial Telecommuting 30

The Next Internet File System 32

Dirt-Cheap Color Printers 36

Unix Survey 42

Network Cameras Go Mobile 44

Entomophagous Bruce Brown 48



CDs for the Gigabyte Era

139

By Tom R. Halfhill

Thanks to DVD technology, next-generation optical discs will hold 25 times more data than current CD-ROMs.

STATE OF THE ART

How to Tame Big Networks

90

By Edmund X. DeJesus

It's easier when you use intelligent design, simulation, and maintenance tools.

Design and Conquer

93

By Nathan J. Muller

Intelligent tools can validate your network design and gauge its performance before you buy a single piece of equipment.

Building the Model Network

101

By Charles D. Knutson

Modeling and simulation provide a cure for pain.

See the Big Picture

107

By Tim Wilson

Software that helps manage mega-size networks.

EVAL

Notes Opens Up to the Web

49

By Steve Gillmor

Lotus Domino delivers Notes databases to Web clients and powerful tools to Notes developers.

X Terminal + Browser + Java = Web PC

50

By Peter Wayner

HDS's @workStation is a low-cost box for Web access, Java applets, and Windows.



Road-Show Romance

55

By G. Armour Van Horn

Proxima's Desktop Projector 4100Z sets a new standard for direct digital projection.

Alpha Learns to Do Windows

56

By Selinda Chiquoine

Digital's clever technology lets you run 32-bit x86 code on an Alpha machine.

LAB REPORT

LAB REPORT: HARDWARE

19 Pentium Portables Do Multimedia

114

By Maggi Bender, Jim Kane, and John McDonough

The current crop of Pentium



notebooks are expensive, but testing shows they're worth it.

LAB REPORT: SOFTWARE

Running on NT

126

By Robert L. Hummel

NT 4.0's Win 95 interface and leading-edge connectivity features make for a valuable upgrade—but beware those nasty installation glitches.

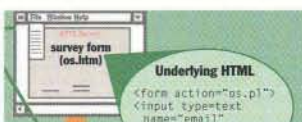
WEB PROJECT

Web Surveys

133

By Jon Udell

With properly designed forms, the Web becomes a valuable resource for data collection.



COMPARISON

Net Savors

145

By Steven J. Vaughan-Nichols

Two backup products take very different approaches to saving network data.

REVIEWS

Enterprise Visual Basic? Almost...

149

By Volker Weber and Hans-Jochen Schmitt

ComUnity OT Framework, Siemens Nixdorf's software for augmenting Visual Basic with business logic and client/server tools, falls short of its goal.

Properties - lbl_credit_limit	
Caption	credit_limit
Enabled	True
Visible	True
Left	120

A C++ Tool That Cures VB Envy

153

By Rick Grehan

Drag-and-drop C++ programming doesn't get any better than Powersoft's slick Optima++.

Notebook Under Construction

154

By Dave Rowell

You can reconfigure Compaq's Armada from a 5-pound notebook to a full-featured multimedia machine.



CHAOS MANOR

Of Zip and Spam and NT 4.0

157

By Jerry Pournelle

Jerry finds uses that go beyond backup for Iomega's Zip drives and takes a first look at the Windows NT 4.0 beta version on a dual-processor machine.

WHAT'S NEW

208

A preview of Matrox's Mystique PCI graphics board, plus a look at Microsoft's Outlook 97.

CODE TALK

Beyond the Bouncing Heads

216

By Rick Grehan

Rogue Wave's JFactory can get you started building Java applications quickly.

SERVICE

Reader Service

Inquiry Reply Cards 144A-B, 200A-B

Index To Advertisers

Alphabetical Order 200
Product Category 202
Editorial Index
by Company 204

PROGRAM LISTINGS

FTP: ftp.byte.com
From BIX: Join "listings/frombyte96" and select the appropriate subarea (i.e., "oct96").

THE BYTE WEB SITE and THE VIRTUAL PRESS ROOM
<http://www.byte.com/>

BYTE (ISSN 0360-5280) is published monthly by The McGraw-Hill Companies, Inc. U.S. subscriber rate \$29.95 per year. In Canada and Mexico, \$34.95 per year. European surface mail subscriptions \$60, airmail \$85. Non-European subscriptions, \$60 surface mail or \$85 airmail. All foreign subscriptions are payable in U.S. funds that can be drawn on a U.S. bank. Single copies \$3.95 in the U.S., \$4.95 in Canada. Executive, Editorial, Circulation, and Advertising Offices: One Phoenix Mill Lane, Peterborough, NH 03458. Periodicals postage paid at Peterborough, NH, and additional mailing offices. Postage paid at Winnipeg, Manitoba, Canada Post International Publications Mail Product Sales Agreement No. 246492. Registered for GST as The McGraw-Hill Companies, Inc., GST #123075673. **Postmaster:** Send address changes and fulfillment questions to BYTE Subscriptions, P.O. Box 552, Hightstown, NJ 08520. Printed in the United States of America.

CORE

OPERATING SYSTEMS

Windows 95: Aiding the Disabled

59

By Joseph J. Lazzaro

Computer users with disabilities need support from their OS to accomplish tasks independently.

NETWORKS

The Backbone of the Web

63

By William Stallings

HTTP 1.1 is a much-needed standard for the growing Internet. Here's what it does and how it works.

CPUs

The Server's Helper

67

By Tom Thompson

Intel's new i960 RP intelligent I/O processor simplifies a server's architecture while also improving performance.

PROGRAMMING

Make Access and the Web Work Together

71

By Rick Dobson

How to use Microsoft Access and ODBC drivers to produce interactive Web pages and on-line databases.

WINDOWS

Photo Quality Arrives for Low-Cost Printers . . . 36

Color ink-jet printers get better, and so do their prices.

Road-Show Romance . . . 55

Proxima's projector lets you leave your notebook home.

Alpha Learns to Do Windows . . . 56

We check out Digital's translator for running 32-bit x86 programs on Alpha boxes.

Windows 95: Aiding the Disabled . . . 59

Built-in features assist users who have disabilities.

3-D for Everyone . . . 76

Direct3D doesn't clear up all the confusion surrounding programming standards.

19 Pentium Portables Do Multimedia . . . 114

These notebooks can handle any Windows application.

Running on NT . . . 126

4.0 is an industrial-strength Windows, but our experience shows you've got to be prepared for compatibility snafus.

Enterprise Visual Basic? Almost . . . 149

Siemens Nixdorf's ComUnity adds client/server smarts to Visual Basic 4.0.

A C++ Tool That Cures VB Envy . . . 153

Powersoft's Optima++ combines the best of Windows development environments with top-notch database tools.

Notebook Under Construction . . . 154

Compaq's Armada is the Lego of notebook computers.

Of Zip and Spam and NT 4.0 . . . 157

At Chaos Manor, Jerry gets

Windows NT 4.0 beta up and running on a dual-processor machine—almost painlessly.

What's New . . . 208

Mail meets PIM: Microsoft's Outlook 97 may be the next step in the evolution of e-mail.

MACINTOSH

Road-Show Romance . . . 55

With TI's digital optics and Adobe's Acrobat technology, Proxima's Desktop Projector 4100Z lets you take a really good show on the road.

3-D for Everyone . . . 76

QuickDraw3D bridges the gap for programmers who need to develop 3-D applications for Macintosh environments.

CDs for the Gigabyte Era 139

Gigantic multimedia products, including full-length movies, will fit on a single DVD.

UNIX

Datapro Report . . . 42

The latest User Ratings Survey shows that Unix folk like the OS's reliability, high performance, and scalability. Still, some are considering NT.

CDs for the Gigabyte Era 139

Besides cramming more data onto a disc, DVD technology will yield drives as fast as today's 9x CD-ROM drives.

NETWORKS

The Server's Helper . . . 67

Intel's i960 RP processor simplifies server architecture.

How to Tame Big Networks 90

This month's State of the Art section covers tools and techniques for designing and managing mega-node nets.

Net Savors . . . 145

We compare two programs that take different approaches to network backup: Cheyenne's ArcServe and Stac's Replica.

Running on NT . . . 126

Windows NT 4.0 has some impressive connectivity features, but our tests show some compatibility glitches.

Enterprise Visual Basic? Almost . . . 149

We review Siemens Nixdorf's ComUnity, software for augmenting Visual Basic with client/server tools.

INTERNET

Self-Help Software to the Rescue . . . 26

Call-avoidance programs put technical support on the Web.

Vendors Battle Over Next Internet File System . . . 32

WebNFS, backers say, could patch one of the potholes on the infohighway: the slow speed of file transfers.

Notes Opens Up to the Web . . . 49

A Web server for Notes users.

X Terminal + Browser + Java = Web PC . . . 50

HDS's @workStation: a low-cost network computer for Web browsing.

The Backbone of the Web 63

How the new version of HTTP supports interactive transactions on the Web.

Make Access and the Web Work Together . . . 71

You can use Access and ODBC to build an interactive database on a Web page.

Web Surveys . . . 133

Combine the right methodologies and tools, and the Web can be a valuable mechanism for conducting surveys.

Beyond the Bouncing Heads . . . 216

Boss says build a Java applet by tomorrow? You might want to check out JFactory.

Agents . . . 14, 145

Backup . . . 38, 145, 157

Bugs . . . 48

CD-ROM . . . 44, 139

Chips . . . 67, 76, 126

Client/server . . . 149

Code translation . . . 56

C++ . . . 153

Databases . . . 49, 71, 133, 139

Disabilities . . . 59

DVD . . . 139

E-mail . . . 44

HTML . . . 133

HTTP . . . 32, 63

Internet . . . 32, 49, 50, 63, 126

I/O controllers . . . 67

Java . . . 50, 216

Memory . . . 76

MMX . . . 19, 76

Mobile computing . . . 55, 114, 154

Multimedia . . . 114, 154

Networking . . . 90, 93, 101, 107, 126, 145

Operating systems . . . 19, 42, 59, 76, 126, 157

PCI . . . 67, 208

Programming . . . 19, 71, 76, 126, 149, 153, 216

Projection systems . . . 55

Printers . . . 36

Security . . . 30

Simulation . . . 101

SNMP . . . 107

Storage . . . 139, 157

Tech support . . . 26

3-D graphics . . . 76

World Wide Web . . . 26, 32, 42, 49, 50, 63, 71, 133, 216

X Window . . . 50



Opticalability

Network Storage Solutions Ranging from 40 Gigabytes to 2.5 Terabytes

Reliability

Pinnacle's Optical Library Systems offer an ideal solution for archiving and retrieving databases, data warehousing and image storage applications with a media shelf-life up to 100 years.

Compatibility

Pinnacle Micro has developed relationships with the leading software manufacturers to ensure compatibility and long term customer satisfaction. Whether you are running UNIX, Novell Netware, Windows NT, Sun Solaris, HP UX or IRIX, we have a solution for you.

Rewritability

Each optical library system features Pinnacle's award-winning Vertex 2.6 GB rewritable optical drive, the fastest in the industry. This system provides random access to information, allowing users to rewrite data millions of times.

Networkability

Users can access large amounts of data from across a network with performance near that of a local system disk. System Administrators can save time by automating jobs such as unattended backup and restore processes that typically require human intervention after hours.

Expandability

Pinnacle's systems provide mass amounts of on-line data. Fill up your disks, remove and archive, then replace with new media for endless storage capacity.

Availability

Pinnacle Optical Library Systems are now available worldwide with a variety of service contracts to meet your needs. To receive a free copy of our **Guide to Optical Library Systems** or to speak to our storage experts call:

800-553-7070

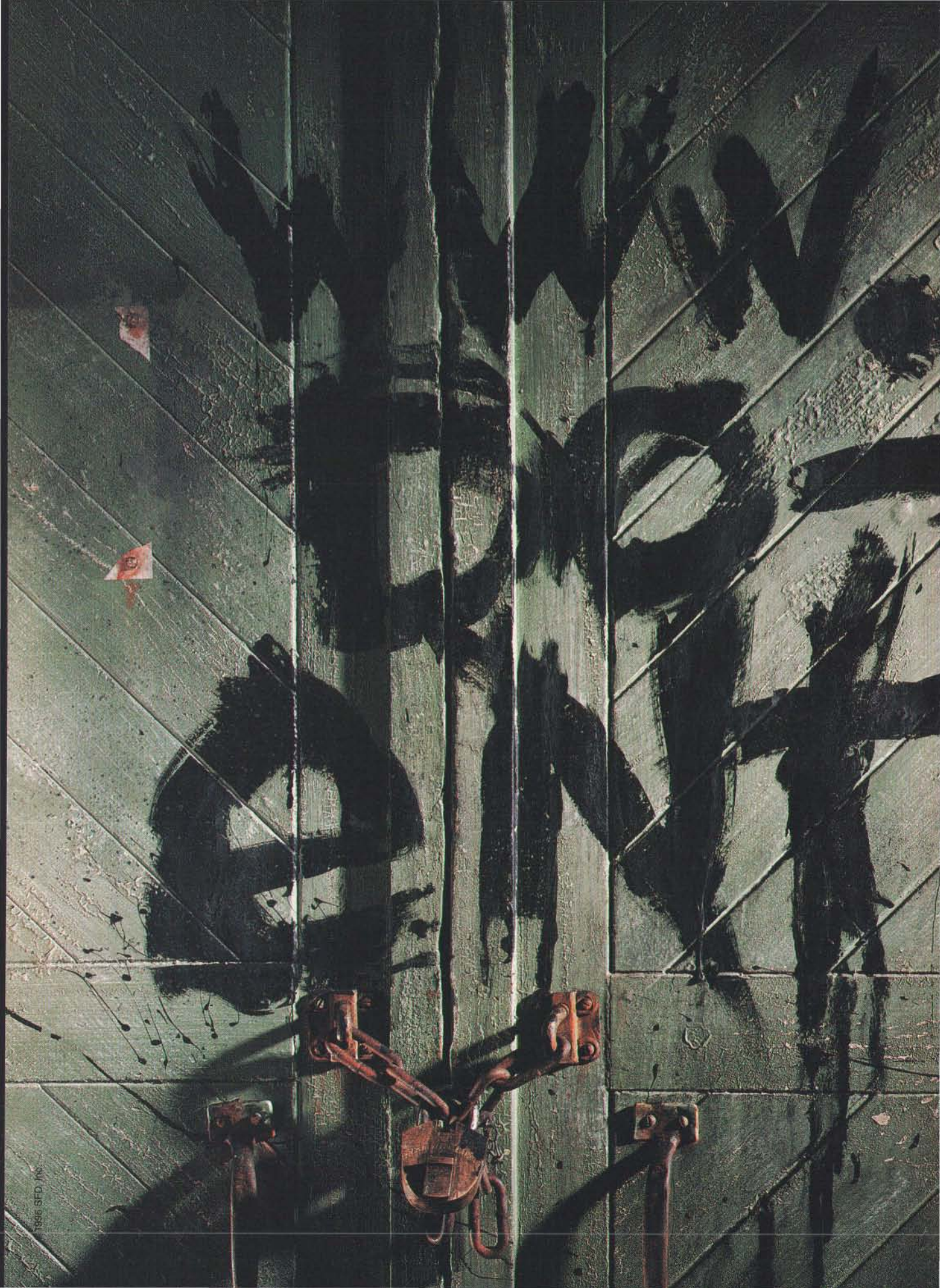


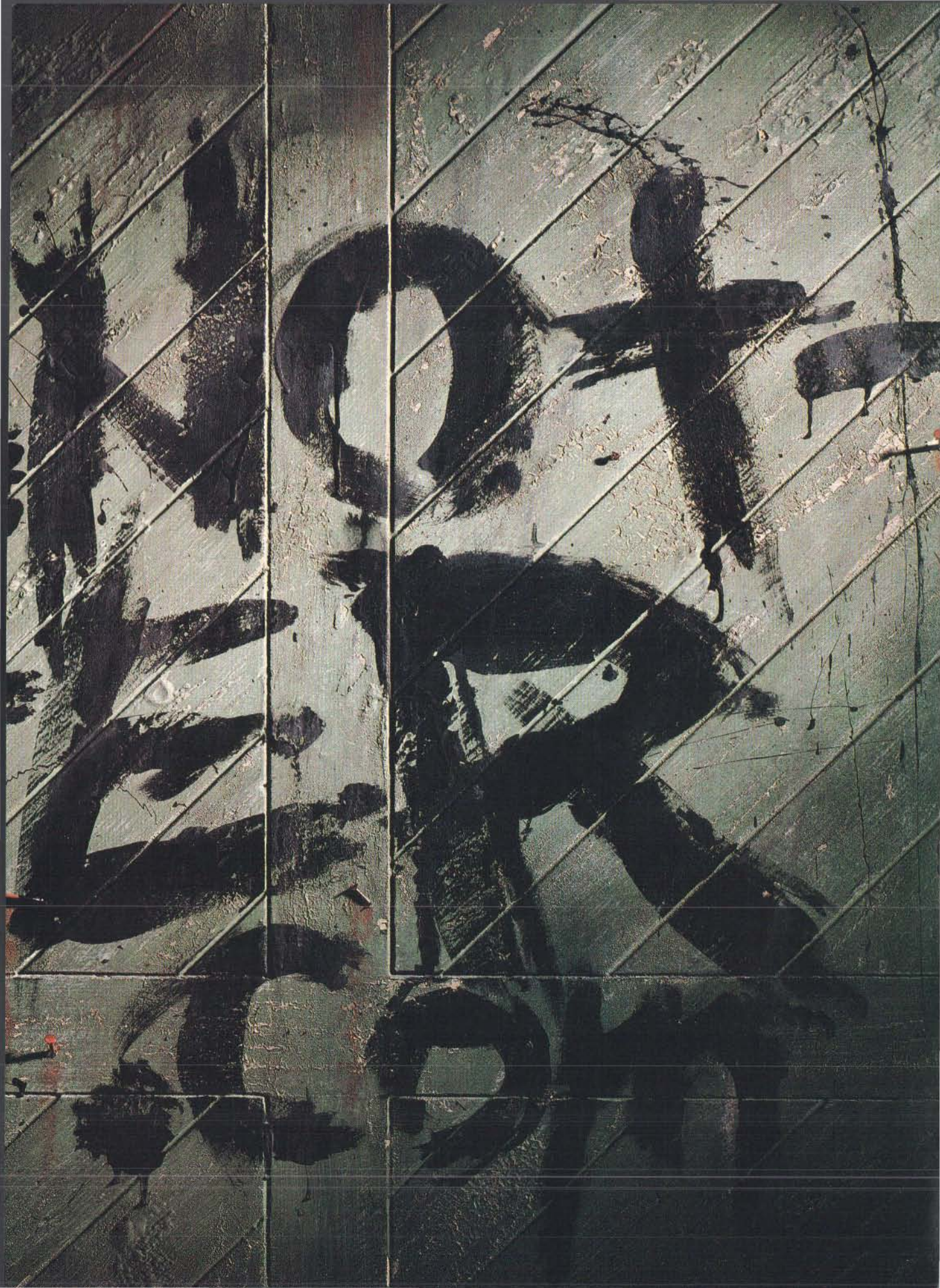
PINNACLE MICRO
THE OPTICAL STORAGE COMPANY

The Pinnacle Micro logo is a registered trademark of Pinnacle Micro Inc. All other trademarks are trademarks of their respective owners.

Tel: 714-789-3000 • Fax: 714-789-3150 • <http://www.pinnaclemicro.com>

Circle 149 on Inquiry Card (RESELLERS: 150).





EDITOR IN CHIEF

Mark Schlack

Editor in Chief's Assistant: Linda Higgins

EDITORIAL

EXECUTIVE EDITORS

International: Rich Friedman
New Media: Jon Udell

MANAGING EDITOR

Jenny Donelan

NEWS

Peterborough:
News Editors: David L. Andrews,
Martha Hicks

Frankfurt:

Senior Editor: Rainer Mauth

REVIEWS

Director of Reviews: David Essex
Senior Technical Editors: Rick Grehan,
Dave Rowell
Technical Editor: Russell Kay

FEATURES

Senior Editor/Features: Alan Joch

Peterborough:

Senior Technical Editor at Large:

Tom Thompson

San Mateo:

Senior Editor: Tom Halfhill

Lexington:

Senior Editor: Edmund X. DeJesus

NEW MEDIA

Production Associate: Joy-Lyn S. Blake

SENIOR RESEARCHER

Rowland Aertker

ASSOCIATE TECHNICAL EDITORS

Dennis Barker, Cathy Kingery,
Warren Williamson

SENIOR CONTRIBUTING EDITOR

Jerry Pournelle

CONTRIBUTING EDITORS

Dick Pountain, Udo Flohr, Mark LaPedus

CONSULTING EDITORS

Stephen Apiki, Nicholas Baran,
Raymond GA Côté, Trevor Marshall,
Stan Miastkowski, Barry Nance,
Roberta Pournelle, Ellen Ullman,
Peter Wayner

EDITORIAL ASSISTANT

Jane Sheldon

DESIGN

Design Director: Charles Dixon III
Associate Design Director/Design &
Photography: Sharon Price
Associate Design Director/Graphics:
Joseph A. Gallagher
Designers: Barbara Busenbark,
Donna Sweeney
Design Assistant: Cindy Sands

FINANCE AND OPERATIONS

Vice President: Claudia Flowers

ADVERTISING PRODUCTION

Advertising Production Manager:
Linda Fluhr
Senior Advertising Services
Representative: Dale J. Christensen
Senior Advertising Production
Coordinator: Lyda Clark
Advertising Production Coordinators:
Karen Cilley, Rod Holden
Operations Assistant: Lisa Jo Steiner
Advertising Graphics Manager:
Susan Kingsbury
Graphics Production Coordinator:
Christa Patterson

FINANCE

Senior Financial Analyst:
Kathleen Deguise
Systems Administrator: Peggy Dunham
Junior Financial Analyst: Diane Henry

CIRCULATION

Director: Susan Blattman
International Circulation Manager:
Barbara Copcutt
Subscriptions Manager: Lynn Lagasse
Assistant Subscriptions Manager:
Christine Tourgee
Subscription Source Specialist:
Carol Sanchioni
Newsstand Manager: Vicki Weston
Assistant Manager: Karen Desroches
Circulation Assistant: Jill Wood

ADMINISTRATION

Human Resources Administrator:
Pat Burke
Receptionist: Agnes Perry

MARKETING AND PLANNING

Market Information Manager:
Edward Fielding
Marketing Services Administrator:
Meredith Bickford
Publisher's Assistant: Donna Nordlund

VICE PRESIDENT/PUBLISHER

John M. Griffin

ADVERTISING SALES

Sales Assistant:
Susan Monkton (603) 924-2635

NEW ENGLAND

John Ferraro (617) 860-6221,
(212) 512-2555
Jeanne Beeson (617) 860-6349

NEW YORK

Michael Feinberg (212) 512-4811
Jill Pollak (212) 512-3585

MID-ATLANTIC/SOUTHEAST

Neil Helms (770) 242-6298
Paul Franchak (614) 899-4912

CENTRAL U.S.

Lori Silverstein (614) 899-4908
Paul Franchak (614) 899-4912

SOUTHWEST

Bert Panganiban (214) 688-5165
Brian Higgins (603) 924-2596

SOUTH PACIFIC

Beth Dudas (714) 753-8140

NORTH PACIFIC

Roy J. Kops (415) 513-6861
Susan Rastellini (415) 513-6951
Lisa Farrell (415) 513-6862

INSIDE ADVERTISING SALES

Assistant: Vivian Bernier
(603) 924-2521

BYTE DECK

Brian Higgins (603) 924-2596

EURO-DECK

Mark Stone (603) 924-2533

REPRINT SALES

Susan Monkton (603) 924-2618

INTERNATIONAL ADVERTISING

SALES STAFF
Director: L. Bradley Browne
(603) 924-2501
Administrative Assistant:
Arja Neukam (603) 924-2636
Copyrights Manager:
Faith A. Ellington (603) 924-2525
See listing on page 201.

HOW TO CONTACT THE EDITORS

We welcome your questions, comments, complaints, kudos, and submissions.

MAIN OFFICE: One Phoenix Mill Lane, Peterborough, NH 03458, (603) 924-9281.

San Mateo: 1900 O'Farrell St. #200, San Mateo, CA 94403, (415) 513-6912.
Lexington: 24 Hartwell Ave., Lexington, MA 02173, (617) 863-5100.

GERMANY/EUROPE: Emil von Behring Strasse 2, 60439 Frankfurt, Germany, +49 69 5801 123.

ELECTRONIC MAIL: On BIX, send to "editors." All BYTE editors and columnists also have individual mailboxes on BIX for easy access.

MCI: 250-0135 BYTE Magazine. Many editors also have individual MCI addresses in their own names.

OTHERS: Many editors also are reachable through uunet, AppleLink, CompuServe, and numerous other services.

WEB: <http://www.byte.com>

U.S. fax: Editorial: (603) 924-2550

Advertising: (603) 924-7507

U.K. fax: +44171 495 6734

SUBMISSIONS:

Authors: We welcome article proposals and submissions. Unacceptable manuscripts will be returned if accompanied by sufficient return postage. Not responsible for lost manuscripts or photos.

Vendors: We welcome news of your new products; please call the News department or the Reviews department at the earliest possible date. We cannot be responsible for unsolicited product samples.

ARTICLE REPRINTS:

For price quotations on customized reprints of BYTE articles, contact Susan Monkton, reprints manager, at (603) 924-2618. (Minimum quantity: 500.)

SUBSCRIPTION CUSTOMER SERVICE

Inside U.S. (800) 232-BYTE; outside U.S. +609 426 7676. E-mail-based customer service: mpcstsvs@mcgraw-hill.com. Web-based customer service: <http://www.byte.com/admin/mpadddchg.htm>.

International subscribers may also contact our international customer service facility in Galway, Ireland, by calling +353 91 752792 or via fax: +353 91 752 793.

For a new subscription, (800) 257-9402 U.S. only.

E-mail: mporders@mcgraw-hill.com or write to BYTE Subscription Dept., P.O. Box 555, Hightstown, NJ 08520.

Subscriptions are \$29.95 for one year, \$54.95 for two years, and \$74.95 for three years in the U.S. and its possessions. In Canada and Mexico, \$34.95 for one year, \$64.95 for two years, \$87.95 for three years. Internationally, US\$60.00 for fast surface delivery, US\$85.00 for air delivery. Single copy price is \$3.95 in the U.S. and its possessions, \$4.95 in Canada. Foreign subscriptions and sales should be remitted in U.S. funds drawn on a U.S. bank. Please allow six to eight weeks for delivery of first issue.

PHOTOCOPY PERMISSION:

Where necessary, permission is granted by the copyright owner for those registered with the Copyright Clearance Center (CCC), 222 Rosewood Dr., Danvers, MA 01923, to photocopy any article herein for personal or internal reference use only for the flat fee of \$1.50 per copy of the article or any part thereof. Correspondence and payment should be sent directly to the CCC, 222 Rosewood Dr., Danvers, MA 01923. Specify ISSN 0360-5280, \$1.50. Copying done for other than personal or internal reference use without the permission of The McGraw-Hill Companies, Inc., is prohibited. Requests for special permission or bulk orders should be addressed to Faith Ellington, copyrights manager, (603) 924-2525. BYTE is available in microform from University Microfilms International, 300 North Zeeb Rd., Dept. PR, Ann Arbor, MI 48106 or 18 Bedford Row, Dept. PR, London, WC1R 4EJ, U.K.

Copyright © 1996 by The McGraw-Hill Companies, Inc.

BYTE

A Division of The McGraw-Hill Companies

All rights reserved. BYTE and **BYTE** are registered trademarks of The McGraw-Hill Companies, Inc. Trademark registered in the United States Patent and Trademark Office.



Member Audit Bureau of Circulation

BIX GLOBAL CONFERENCING SYSTEM, AN ON-LINE COMMUNITY

ACTING MANAGING EDITOR

Peter Olson

INFORMATION ENGINEER

Peter Olson

MEMBER SERVICES MANAGER

Chuck Greenslit

EXCHANGE EDITORS

Amiga Exchange: Joanne Dow
Entertainment and Leisure Exchange: Rich Taylor
IBM Exchange: Barry Nance
Programmers Exchange: Bill Nicholls
Professionals Exchange: David Reed
Tajjery Exchange: Jerry Pournelle
Windows Exchange: Karen Kenworthy
Writers Exchange: Wayne Rash Jr.
Macintosh and Other Exchanges: At Large

BIX is the BIX Information Exchange, your best source for technical advice.

BIX is owned and operated by Delphi Internet Services Corporation.

Find us on the Web at <http://www.bix.com/> (all browsers are welcome).

E-mail our autoresponder at info@bix.com or fax us at 617-441-4902.

Dial us by modem at 800-695-4882 or 617-492-8300 (V.34 28.8kbps).

Telnet to x25.bix.com or call us (voice) at 800-695-4775 or 617-354-4137.

Connect via packet networks to host BIX.

Look in the last few pages of this magazine for our advertisement.

The world is changing faster than you think; don't be caught by surprise!

OFFICERS OF MCGRAW-HILL, INC.:

Chairman and Chief Executive Officer: Joseph L. Dionne; President and Chief Operating Officer: Harold W. McGraw III; Senior Vice President and General Counsel: Kenneth M. Vittor; Executive Vice President and Chief Financial Officer: Robert J. Bahash; Senior Vice President, Treasury Operations: Frank D. Penglase; President, Information Services Group: Michael K. Kehir; Executive Vice President, Publication Services: Norbert Schumacher.

Founder: James H. McGraw (1860-1948).



High-res MEETS Hi-Fi.

Introducing the only projector combining exceptionally smooth SVGA graphics and amazing shake-the-table sound – the new LitePro® 620.

For starters, it's got Digital Light Processing™, so you get unsurpassed, film-quality graphics and video. And it's got a better audio system than most cars, featuring four high-powered JBL® speakers.

Plus, it projects a super-bright 400 lumens in full colour (an eye-popping 1400 lumens in Greyscale Mode). And since In Focus projectors are easier to connect and use, more people have bought them than any other.

So check out the new In Focus LitePro 620 today. It's where high-res meets hi-fi.



InFocus®
S Y S T E M S

Great ideas. Brought to light.™



Circle 724 on Inquiry Card.

Discover electronic presentations. For a test drive or free demo disk call

UK: 0500 262 440 Germany: 0130 813 649 France: 0590 5993 Italy: 1678 77238 Spain: 900 993 163

European Head Office Planetenweg 91, 2132 HL Hoofddorp, The Netherlands. Tel: +31 23 5623200, Fax: +31 23 5624388.

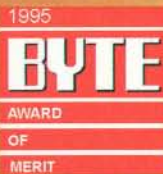
In Focus is a registered trademark of In Focus Systems, Inc. Digital Light Processing and DLP are registered trademarks of Texas Instruments Incorporated.

Deliver Industrial-Strength Decision Support Tools and Watch the Sparks Fly!

Delivering effective decision support for hundreds or thousands of users is definitely not child's play. It takes powerful, mature tools. IQ Software's decision support tools are industrial-strength, best-of-breed products that can be deployed individually or as a total decision support solution.

IQ/Objects™ Robust Query and Reporting

For end-user query and reporting, IQ/Objects is simply unbeatable. This award-winning tool's familiar, easy-to-use Microsoft look and feel belie the awesome power of its true object-based technology. IQ/Objects supports everything from simple ad hoc queries to the most sophisticated cross tabulations. Reusable objects let users combine new queries and reports with previously saved ones to create sophisticated reports easily and quickly. A selection of templates makes it easy to create presentation-quality results in minutes.



IQ/SmartServer™ Three-Tier Architecture

IQ/SmartServer provides production reporting, scheduling and job monitoring facilities. This elegant three-tier architecture implementation harnesses the power of servers (UNIX and NT) to reduce network traffic and deliver a scalable, manageable, high-performance solution. IQ/SmartServer cures fat client performance problems without limiting user access to information.

IQ/Vision™ Multidimensional Analysis

IQ/Vision works directly with relational databases and Arbor's Essbase or can be implemented with its own MDDDB to deliver a complete OLAP solution. For robust multidimensional and drill-down analysis, nothing is easier to use or functionally as rich as IQ/Vision. An intuitive interface displays information in interactive charts or cross tabs, allowing any user to visually slice and dice, drill up and down, nest dimensions, flip axes, and rotate dimensions – all with point and click simplicity.

"IQ/Objects – A breakthrough technology for query and reporting tools."

Aberdeen Group

"IQ Software has brought the power of objects to mainstream business intelligence."

Patricia Seybold Group

"IQ/Vision is an extremely powerful and easy to use OLAP tool that shines with complex data."

Information Week Labs

IQ/LiveWeb™ Web-enabled Decision Support

IQ/LiveWeb links corporate databases and cyberspace, turning your intranet into a source of live database information. With IQ/LiveWeb, users can request and view reports anytime, anywhere using a standard Internet browser. IQ/LiveWeb lets you design and build database reports, charts and cross tabs.

Server-based publishing makes it easy to keep those reports current. Simply tell IQ/LiveWeb the schedule. That's it. IQ/LiveWeb automatically executes your requests, refreshing the information and publishing it to your intranet.

Special Offer! For a limited time, download a fully operational copy of IQ/LiveWeb, valued from \$4,000 to \$20,000, absolutely free. See <http://www.iqsc.com> for details.

Start the sparks flying! Contact us today for details on our industrial-strength tools.



800-458-0386

info@iqsc.com

<http://www.iqsc.com>

European Subsidiaries & Affiliates: UK (44) 1-962-844-777, France 33 (1) 474-903-04, Italy-Dexia Italia (39) 6-517-933. International Distributors: Australia (61) 2-369-1932, 2-975-7669, 2-436-2788, Canada-Information Access (416) 620-5811, Chile (56) 2-341-4785, Hong Kong (852) 2541-9900, Mexico (52) 5-575-6098, Singapore (65) 298-3838, South Africa (27) 11-421-4800, Spain (34) 50-27-55-11. For distributors in all other Pacific Rim countries, call (65) 334-1936; European countries call the UK office, and all others call IQ Software's U.S. headquarters.

Circle 171 on Inquiry Card (RESELLERS: 172).

Wanted: New Software

Today's shrink-wrapped applications are the last place you'll find innovation.

The search for the killer desktop app is dead, judging from the dearth of anything really interesting outside of the graphic arts/multimedia and geographic-information markets. Amidst a golden era of OSes, server software, Web stuff, and development tools, the best you can say about most desktop apps is that they are easier to install now that they come on CD-ROMs instead of floppies.

Too harsh? What was the last new client application authored by Microsoft? I come up with Access, in 1992, and even it wasn't totally homegrown in Redmond. This year's FrontPage was acquired in full, although it has since been seriously reworked. Lotus's now-defunct Improv came out for Next in 1990 and for Windows in 1993. Apart from these few, all we've seen are continuing improvements (albeit not unappreciated ones) to existing suites, accompanied by feature bloat.

"Who cares?," ask the Webmeisters. "With Hypertext Markup Language [HTML], Java, a browser, and plug-ins, shrink-wrapped software is a dinosaur."

The Web is a powerful tool, and it really has changed everything. The ferment in Web tools and server applications will obviously produce profound innovations—probably even one of those legendary paradigm shifts.

But I'm not buying into the idea that server apps will completely replace desktop apps in this decade. The bandwidth and network reliability are just not there. And ultimately, whether software vendors write applications in giant hunks of C++ code and deliver them on CD-ROMs—or write them in small pieces of Java code and wire them to us—apps will still need to be more innovative.

Nor will custom development replace packaged software, even if the most opti-

mistic scenarios about programmer productivity and code reuse come true. No company has the time or money to be its own sole source of software.

The greatest innovation in computing since the invention of the microprocessor has been shrink-wrapped software. The ability of computer professionals to deliver fast, inexpensive solutions will, for the foreseeable future, depend on the weaving together of custom and shrink-wrapped server and client applications.

My hope is that the industry will do something more than just add HTML converters to five-year-old apps. For example, seven years after Hewlett-Packard unveiled its ultimately unsuccessful NewWave shell for Windows, I'm still waiting for easy-to-use but powerful agents.

Want thankful users? Give them software that automates the repetitive yet



to clear the hurdles that large software companies put in front of new product development. I imagine that any product manager with fire in the belly still has to answer to company bean counters who ask, "Is there a \$100 million market for

The greatest innovation in computing since the invention of the microprocessor has been shrink-wrapped software.

complex tasks that consume most workdays. I would love something that I could "program" to gather memos, spreadsheets, e-mail, and whatever else I need to assemble monthly reports.

My impression that the software industry has entered a slacker phase was reinforced by a recent trip to Xerox's fabled Palo Alto Research Center. At PARC, you can see real innovation in areas as conceptually simple and practically difficult as viewing large amounts of data (an entire company organization chart, for example) quickly and easily. The kinds of inexpensive graphics hardware discussed in this month's cover story open up even more possibilities in this arena.

Maybe it's hard for concepts like data visualization and cross-application agents

the product this year?" I sure hope that someone out there is looking beyond today's installed base.

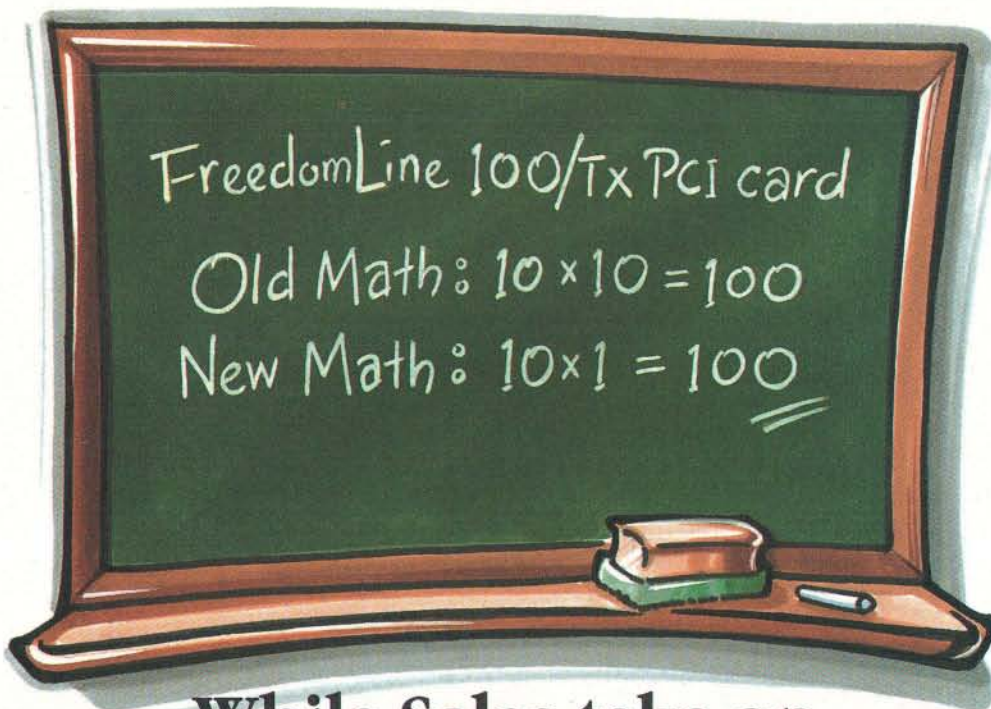
When I go to Comdex next month, I'll be looking for interesting and practical new desktop applications to present our Best of Comdex awards to. (Vendors: See <http://www.byte.com/vpr/vpr.htm> for details.) Tell me what you need from shrink-wrapped software in our forum at <http://www.byte.com>. I'll carry the message back to the software industry.

Mark Schlack

Mark Schlack, Editor in Chief
mschlack@bix.com

Complex Fast Ethernet

At Complex, our Engineers follow
the Old School Math.



While Sales take on
a Whole New Philosophy.

Introducing **the FreedomLine 100/TX PCI****.

A 100Base-TX PCI adapter from Complex to power your network at 10 times the speed of a 10Mbps card, **but at the price of one!** Incorporating the **NWay Auto-Negotiation mechanism**, the card detects network speed and can automatically configure itself to 10Mbps or 100Mbps operation without user intervention. What's more, if used with a suitable switching hub, the FreedomLine

100/TX PCI can double channel bandwidth for 10Base-T and 100Base-TX users. And everything mentioned above at the price of a 10Mbps card. Too good an offer to believe? Call us for more details or check out our website at <http://www.cpx.com>.

**Gained an excellent rating in
LAN Times Test Report (22 July 1996)



Networks that work



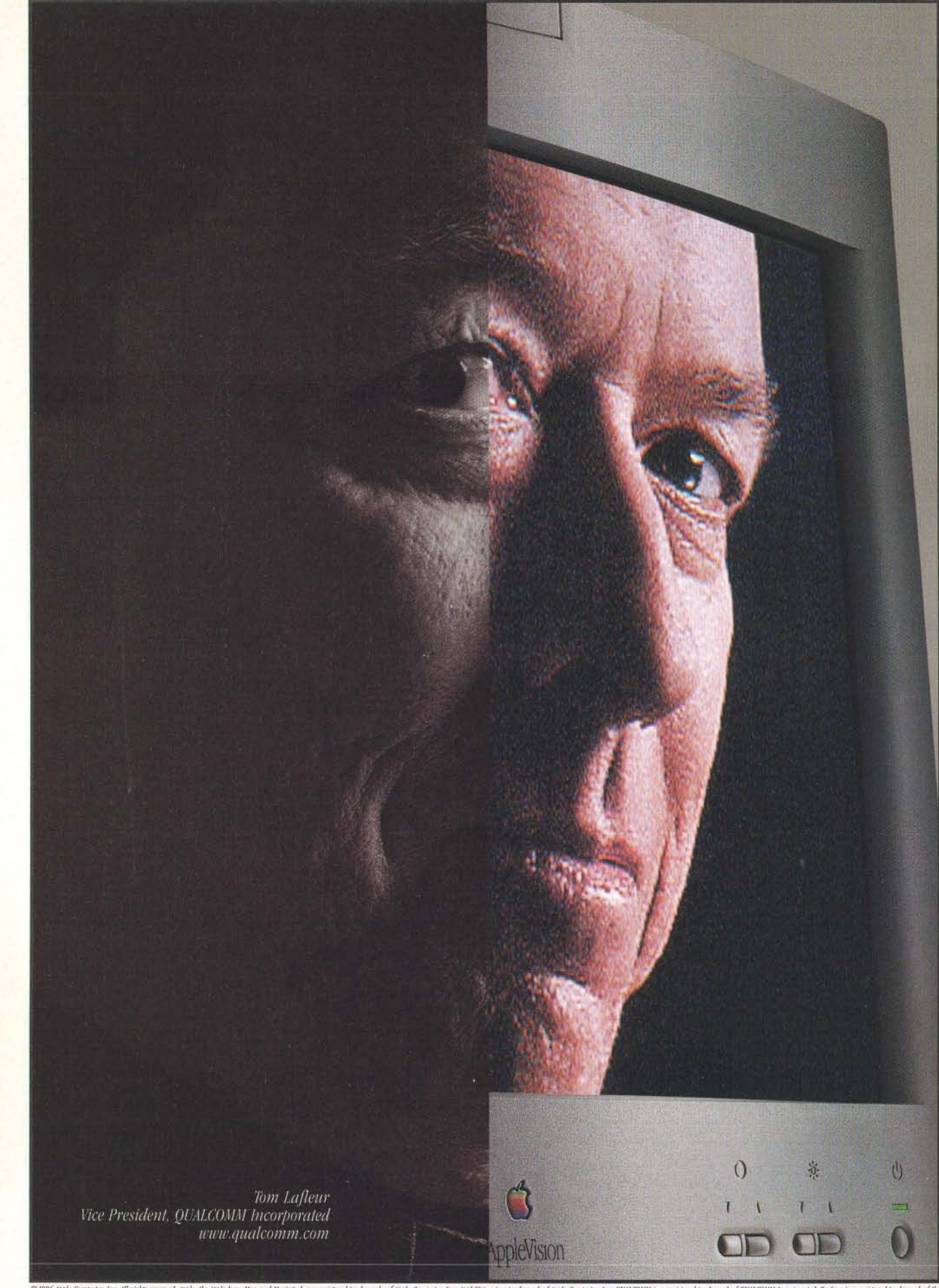
COMING SOON:
the snappable,
16-port Complex MicroHub
Plus 100/TX16

U.S.A.
COMPEX, Inc.
4051E. La Palma Ave
Anaheim, CA 92807 U.S.A.
(714) 630 7302
Fax (714) 630 6521

Circle 701 on Inquiry Card (RESELLERS: 702).

GERMANY
ReadyLINK Networktechnology GmbH
Albert-Einstein-Straße 42
63322 Rodermark, Germany
(49) 607 4 98017
Fax (49) 607 4 90668

SINGAPORE
COMPEX Systems Pte Ltd
135 Joo Seng Road,
Singapore 368 368
(65) 288 8220
FAX (65) 280 9947



Tom Lafeur
Vice President, QUALCOMM Incorporated
www.qualcomm.com



AppleVision



THERE'S A PLACE WHERE WALLS BETWEEN OFFICES ARE REPLACED BY WORDS.

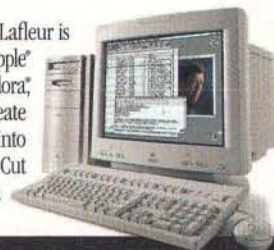
Where questions never go unanswered.
Where the people you need to find can always be found.

Where information forever eludes the bottleneck.
And misunderstanding has taken a leave of absence.

IT'S A PLACE CALLED THE INTRANET.

And you can take your business there on a Macintosh.

As V.P. and resident visionary for QUALCOMM—one of the brightest stars in digital wireless communications—Tom Lafleur is finding innovative ways to stay ahead of his company's phenomenal growth with the help of the WorldWideWeb and Apple® Macintosh® computers. In fact, Tom started QUALCOMM's Intranet by running one of their own products on a Mac®—Eudora®, which has since become the most popular e-mail software for the Net. Today, people are using Macintosh to easily create web pages and share details of their projects with the rest of the organization. So engineers have instant insight into manufacturing problems, can pull up drawings and quickly resolve issues. Which has slashed the need for paper. Cut support costs. And sparked unprecedented collaboration. Not to mention knocking a few walls down along the way.



For more information on Apple products and solutions, or to subscribe to our electronic newsletter, visit us at www.solutions.apple.com/intranet



START REPLACING WALLS WITH WORDS.



It's time to remodel. And the Apple® Internet Server Solution is one of the fastest, easiest ways to transform your company.

By dramatically improving communications. By unlocking hidden information. By knocking down a few walls.

With it, you can easily turn your network into an Intranet — an information warehouse where people can find answers to just about any question, and share results with just about anybody.

Now, virtually any document — from internal phone books to requisition forms to invoices — can be converted to electronic form and quickly updated. So people can more accurately and easily manage their work flow.

The Apple Internet Server Solution makes it easy for people to find new ways to communicate. Easy to support Windows and UNIX®. Easy to grow. And, since security is built in, easy to prevent break-ins.

All the software that people need to set up, author and maintain their web page is included as well. Software available only for Macintosh®. Like Adobe™ PageMill™, which makes creating a web page as simple as creating a word processing page. No complex languages to learn. No editors or browsers to juggle.

To find out more, visit us at the web address below. And discover a whole new way to reengineer your business.



Apple Premium Server Resellers are available to help you determine which solutions are best for your business.

For more information on Apple products and solutions, or to subscribe to our electronic newsletter, visit us at www.solutions.apple.com/intranet



You're Welcome!

Tom Thompson's "The Network in the Server" (July) is the most lucid and helpful explanation of Tandem's ServerNet system area network and its potential applications that I have seen. That includes our own internal publications. Thank you.

Matt Riesz

Senior advisory systems analyst
Tandem Computers

I just read "The Network in the Server" and am impressed by the clarity with which you explained the NUMA-Q architecture. Congratulations.

Kevin Joyce

Marketing manager, NUMA-Q
Sequent Computer Systems

NT Trade-offs

I enjoyed the excellent article about Windows NT, "4.0 Isn't for Everyone," by David Linthicum in the July issue. I was puzzled, however, by the absence of a fairly obvious conclusion: The considerable performance penalty imposed by the new shell and the questionable architectural changes made to accommodate it may make sense on a workstation, but they are of dubious worth on a server. With 4.0, the design center of NT seems to have shifted decisively toward the client.

That's fine for me; I'm interested in NT primarily as a workstation OS—interest motivated primarily by stability. But my guess is that

Microsoft will have a hard time converting server owners, whether from NT 3.51 or from other OSes.

Will Kling

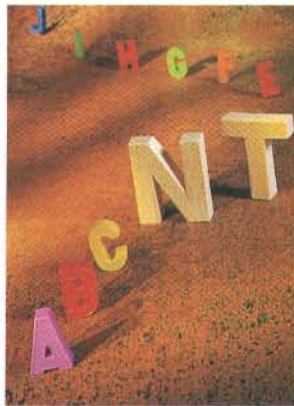
Milford, NH

"4.0 Isn't for Everyone" was informative, but you make too much commotion about the kernel-mode issue. Although moving the graphical device interface (GDI) into the NT Executive gives it the potential to crash the OS, this does not seem likely. The current GDI/Window Manager subsystem is highly stable and rarely faults. The move to kernel mode only simplifies its design, making it easier to debug. Since version 3.1, all of NT's other low-level device drivers (disk device drivers, SCSI controller drivers, etc.) have operated within the Executive with a high degree of reliability. There is no reason to suggest that the graphics subsystem need be any different. If, in NT 3.51, CSRSS.EXE faults for any reason, the whole OS shuts down, as it is considered a critical process. What is the practical difference if the graphics subsystem crashes and the OS subsequently shuts down, or if the graphics subsystem crashes and takes the OS with it?

Rene Gollent

100642.1147@compuserve.com

The GDI issue involves the potential for OS failure due to reengineering of NT. The claim that the NT 3.5 kernel is inherently stable does not



automatically carry forward to the next instance of the OS, considering the changes that Microsoft has made. At the beta stage (Build 1234), it was unclear how moving GDI to Ring 0 might affect stability in the final release—we were not able to crash the beta system. However, as with other operating systems that exploit Ring 0, the trade-off is stability for performance. Microsoft is selling NT as an OS that is more stable than Windows 95 and as an OS reborn for the client. The changes made to NT to sell it as a high-performance client could jeopardize its traditional use as a server OS. That's why I made an issue of it. As I write, Windows NT 4.0 is just leaving beta. We'll

know who's right about the GDI issue very soon.

—David Linthicum

"NT and the Net" (July) provides a good overview of Microsoft's strategies surrounding its Internet Information Server (IIS). The discussion of the benefits of the Internet Server API (ISAPI), however, failed to give credit where credit is due. The interface now known as ISAPI was first developed as a proprietary interface by Process Software (<http://www.process.com>) for its Purveyor or Web server for Windows NT. Late last year Microsoft and Process announced their collaboration on an open standard—ISAPI—based on the Purveyor API. To both companies' credit, DLLs written to the original API still function under ISAPI using both Purveyor and IIS.

Steve Loper

Amadeus Consulting Group
sloper@wolfgang.com

You Can Teach an Old Chip

Kudos (again) to Tom Halfhill for his detailed yet

HOW TO CONTACT US

ON THE WEB

Visit The BYTE Site!
Search our archives.
Download articles. See
industry press releases.
Join on-line discussion
conferences with other
BYTE readers!
<http://www.byte.com>.

BY FAX

(603) 924-2550

BY E-MAIL

Address letters to editors@bix.com. To reach individual BYTE editors, see The BYTE Site on the Web for a directory. Letters may be edited for publication.

BY POST

Editors, BYTE, One
Phoenix Mill Lane,
Peterborough, NH
03458

SUBSCRIPTION CUSTOMER SERVICE

U.S. only: (800) 232-2983; international: (609) 426-7676; or see www.byte.com/admin/mpcstsvc.htm

For advertising and other noneditorial contacts, see page 10 or click on the Information link on The BYTE Site.

clear explanation of how the MMX instructions work with Intel-type CPUs ("x86 Enters the Multimedia Era," July). The article's nuts-and-bolts focus typifies why BYTE is a valuable resource for all of us.

Tony Dahlman

76456.3461@compuserve.com

Another Lesson Learned

As your July Web Project column was about "Lessons Learned," I am prompted to suggest this lesson: In cases where a quoted URL refers to a directory, or to the "top" of a site, almost everyone these days (including BYTE) seems to omit the trailing "/". This is wrong for at least two reasons.

First, if my browser requests <URL:http://www.some.company/directory>, an HTTP_error_302 is raised, resulting in an extra

transaction between browser and server to correct the URL to <URL:

http://www.some.company/directory/>.

It works, but it generates extra traffic, which contributes to an already crowded Net. Second, consider a Web server, like Zeus (<http://www.zeus.co.uk/>), that actually does content negotiation. You don't, for example, put extensions on image files. Instead of , you would write .

The server looks at the HTTP_ACCEPT string and determines whether the browser can display GIF, JPEG, XBM, etc., then serves the best or smallest image accordingly. So, if we have a directory called /images/mypic/ but refer to it as /images/mypic, aren't we potentially in trouble?

Adam Shaun Nealis

adam@lbs.lon.ac.uk

I think you're right on both scores. I do try to include the trailing slash to avoid the extra bit of negotiation you describe. That's pretty well known. But the second case you bring up is really interesting. I've been only vaguely aware of progress in standards for content negotiation, but if it ends up working in the way you describe (i.e., no file extension means negotiate best type), then that would certainly be another reason we should all try to be more precise about trailing slashes. —Jon Udell, executive editor

Free PCs!

How is the system Gary Tripp describes in "Forget \$500 PCs: How About Free Ones?" (Bits, August) fundamentally different from the old mainframe model? The details may differ, but we still have terminals gaining access via communication lines to a central store of information and using a central, remote processor for anything beyond trivial or presentation-related tasks. Isn't this what personal computers were invented to get us away from? And isn't it a recipe for generating insatiable demand (presuming the cost can be made acceptable) for bandwidth? The basic idea of the personal computer was and is personal control over the physical computing machinery, as well as avoidance of the bureaucracy and high priesthood that inevitably develops around a mainframe or its network equivalent, along with the requirement that you pay every time you use it. Recall how IBM became great: by leasing computing power, not selling it. When networks become the computer, at

least in the form promoted by the "Web PC" types and Microsoft, computing is no longer personal; it has returned to the mainframe orientation we once rebelled against.

Mike Brady

73720.1544@compuserve.com

The PC revolution has brought us cheap computing power, but it's not cheap enough. The only way to get computing into the hands of the 75 percent of the U.S. population and 95 percent of the rest of the world that currently lack access is to change the model from a software and hardware base to a service base. Leasing won't work. Most people who need access wouldn't qualify, and necessary hardware and software upgrades require short amortization cycles. The "free PC" is a return to the central computing model, but with two changes: It is offered to the public, and it is fundamentally mobile. A service-based approach that uses PC servers connected via radio modems can give everyone access to e-mail, faxing, accounting, word processing, and the Internet, plus secure personal data storage, for about \$20 a month. This approach recognizes bandwidth limitations by placing the central processor close to the user at the local ISP and connecting everyone by radio-frequency cells. Using templates stored in the "free PC" rather than applications to do most tasks reduces local processing and the amount of data transmitted. Internet usage is the bandwidth hog in the model, but if you strip out the graphics, the data stream becomes small. The "free PC" will provide mobile access but will not replace the PC for more intensive computing uses. —Gary Tripp

continued

MMX Misaligned

On reading your article on MMX performance optimization ("Programming Strategies for Intel's MMX," August), I find the example stack prologue code on page 64 does nothing to cause 64-bit alignment, only 32-bit alignment. The alignment mask should be 0FFFFFFF8, not 0FFFFFFFC.

Jan Bottorff

janb@pmatrix.com

You are correct. The assembly code listing in the text box "Maintaining Stack Alignment" contained an error and, as a result, aligns the stack to 32 bits. In order to align the stack to 64 bits, the alignment mask should be 0FFFFFFF8, as shown below.

```
Prologue:
push    ebp                ;save old frame ptr
mov     ebp, esp           ;make new frame ptr
sub     ebp, 4             ;make room for stack ptr
and     ebp, 0FFFFFFF8    ;align to 64-bits
mov     [ebp], esp         ;save old stack ptr
mov     esp, ebp           ;copy alignment ptr
sub     esp, FRAME_SIZE   ;allocate space
```

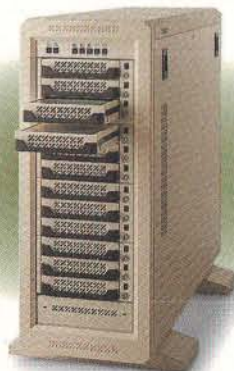
—Bev Bachmayer, Intel Corp.



OUR STORAGE PRODUCTS ARE JUST AS TOUGH.
AND JUST AS GOOD-LOOKING.



When it comes to storing data, durability is a very attractive feature. So Kingston® offers a complete line of the world's most rugged and reliable data storage subsystems. Kingston's storage products were designed for the most demanding commercial environments. But they've also survived duty in tanks, submarines, and even the space shuttle. You can't buy a more reliable subsystem. To prove it, we offer a seven-year warranty — the longest in the industry. The Kingston Data Silo® DS500 tower or rack-mount enclosure can house 3.5-inch and 5.25-inch half- or full-

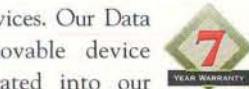


height SCSI peripheral devices. Our Data Express® DE300 removable device subsystems, integrated into our

DS500 chassis, provide an ideal housing for up to 12 removable, hot-swappable SCSI devices.

Of course, Kingston storage products are compatible with all major platforms. For more information call us domestically at (800) 435-0670 or for international sales call (714) 437-3334.

It could be the beginning of a beautiful relationship.



Kingston
TECHNOLOGY CORPORATION

RAMfax call domestically at (800) 435-0056 or for international sales call (714) 435-2677 or visit our Web site: <http://www.kingston.com/b.htm>



Circle 142 on Inquiry Card (RESELLERS: 143).

Kingston Technology Corporation, 17600 Newhope Street, Fountain Valley, CA 92708 USA, (714) 438-1850, Fax (714) 438-1847. © 1996 Kingston Technology Corporation. All rights reserved. Computing Without Limits is a registered trademark of Kingston Technology Corporation. Data Express, Data Silo, and Kingston are registered trademarks of Kingston Technology Corporation.

What's the **BEST WAY** to eliminate MEMORY LEAKS?

- ☐ a) Plumbers Caulk
- ☐ b) Debug Them Yourself
- ☐ c) High Performance Garbage Collection for C/C++
- ☐ d) Ear Plugs

If you checked "c"...you are right. Just by linking Great Circle, a high-performance garbage collector, with your programs, you automatically eliminate all the memory leaks and premature frees—even from 3rd party libraries, legacy code, and DLLs.

And if you think "Memory Debugger" ought to have been an option above, then you should *really* look into Great Circle, because you're spending way too much time debugging leaks.

Call 1-800-360-8388 to learn about Great Circle or for your free copy of the "Garbage Collection for C/C++" White Paper. *And never debug a memory leak again!*

“☆☆☆☆”
“...more robust code
with less headbanging.”
As reviewed by
Software Development
8/96 issue date.

GreatCircle
from
Geodesic systemS.
Phone: 312/728-7196
Fax: 312/728-6096
E-mail: info@geodesic.com
VISIT OUR WEB SITE:
<http://www.geodesic.com>

BY106

MOVING?

To change your subscription mailing address, please complete the form below and send it to:

BYTE

BYTE Subscriber Services, PO Box 555, Hightstown NJ 08520
Fax: 609-426-7087
Phone (9 a.m. to 8 p.m., Eastern Time, Mon-Fri.)
800-232-2983 (U.S.), or 609-426-7676

Current/Old Address:

Account Number

Name

Company

Address

City/State/Zip

New Address:

Name

Company

Address

City/State/Zip

Please allow up to 8 weeks for this change to become effective.

A Division of The McGraw-Hill Companies



inbox

FIXES

Due to an editing error in "Adieu, Pentafluge... Hello Cyrus" (August), we described Jerry Pournelle's new Cyrix 6x86 machine as having an "EIDE CD-ROM drive running off an Adaptec Ultra SCSI board." We meant to say it has an EIDE CD-ROM drive, and a 4-GB Fast SCSI-2 hard drive running off an Adaptec Ultra SCSI board.

Due to an editing error in "Future Watch" (Bits, August, page 28), we wrote: "Because it runs at only 70 nanoseconds, EDO RAM

incurs wait states at higher speeds." The sentence should have said: When running at 70 nanoseconds, EDO RAM incurs an additional wait state in systems with 66-MHz or faster bus frequency.

In our news story "Cyrix 6x86 Matches Pentium" (Bits, September), we neglected to include the SYSmark/32 benchmark results for a baseline Cyrix 6x86-based PC, without 64-MB cache. That number, 159, is comparable to the score of a 200-MHz Pentium Dell, which pegged a 161.

COMING UP IN NOVEMBER

STATE OF THE ART

NEW CHIP TECHNOLOGIES

BYTE takes an in-depth look at how new CPUs will alter system design. We'll examine the recent evolution of Intel processors, from MMX technology to what we've learned about the P7 (Merced); look at chips designed to run Java applications; and bring you the latest news from October's Microprocessor Forum.

SPECIAL REPORT

OPERATING SYSTEMS

BYTE reports on the rise of 64-bit OSes, from existing examples, like SGI's Irix, to future possibilities, like Hewlett-Packard/SCO's joint project. We'll also check the progress of Microsoft's Cairo and analyze the technical merits of Apple's Copland.

CORE

PARALLEL PROCESSING FOR THE MAINSTREAM?

Dick Pountain reports on Bulk Synchronous Parallelism, a new programming model that promises portability between different parallel-computing architectures.

REVIEWS

NSTL HARDWARE LAB REPORT

NSTL rounds up systems based on Intel's leading-edge 200-MHz Pentium Pro processor.

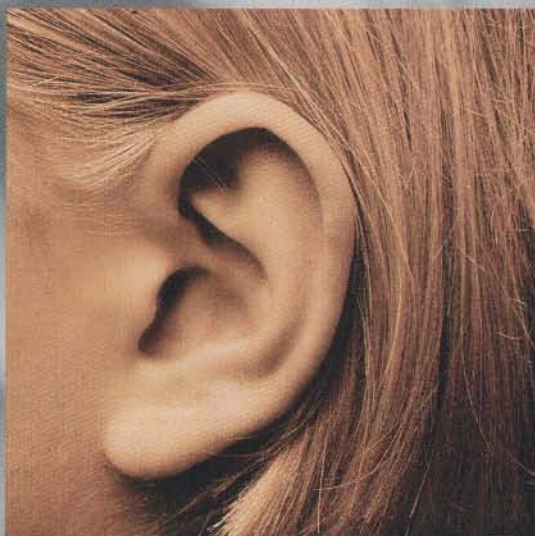
THREE-TIER CLIENT/SERVER DEVELOPMENT TOOLS

In a follow-up to our June Software Lab Report, NSTL tests PowerBuilder 5.0 from Powersoft and Centura Application Server from Centura (formerly Gupta). Both upgrades offer important new application-partitioning features for distributing your application's objects over a network.



Ministry of
Economics,
Technologie and
Transport
Nordrhein-Westfalen
Germany

GERMAN PRECISION



Anyone who doesn't understand the problem can't solve it. We listen precisely in order to know what you need. And we have the know-how, the ideas and the capability to connect things. And that's how innovative products and solutions for the challenges of tomorrow come about.

We in NRW, where precision is tradition.

Comdex, Las Vegas, Sands Expo & Convention Center
18. - 22. November 1996

Toll free fax back: 1-800-700-8247 ext. 400

NRW.

made
in
Germany

COMDEX
Fall '96

Circle 193 on Inquiry Card.

<http://www.byte.com/vpr.htm>
scan for: nrw.



AUSTRIA

VIENNA
Lehrmittelzentrum
Tel: 01 587 1006
e-mail: gwogmay@pop.tuwien.ac.at

BELGIUM

All our books are available through your local STANDAARD or FNAC Bookshop and key stockists include:

BRUXELLES

Agora & Sciences
Tel: 02 6485400
FNAC Brussel
Tel: 02 2092211
WH SMITH
Tel: 02 2192708

ANTWERPEN

De Groene Waterman
Tel: 03 2329394

GENT

Marnix Boekhandel
Tel: 09 2251092

LEUVEN

L Wouters
Tel: 016 233481

LOUVAIN LA NEUVE

Agora O.I.L.
Tel: 010 452947

CYPRUS

LIMASSOL

Zaas Info-Tech
Tel: 05 346211

DENMARK

COPENHAGEN

G.E.C. Gad
Tel: 031 54 80 11
Naturfagsbøger
Tel: 035 37 11 33
Samfunds Litteratur
Tel: 031 35 19 42

LYNGBY

Polyteknisk
Tel: 045 88 14 88

ODENSE

Students Bookshop
Tel: 066 15 87 47

FINLAND

HELSINKI

Akateeminen Kirjakauppa
Tel: 00 121 4321
Svoma Iain Kirjakauppa
Tel: 00 852 7861
University Bookstore
Tel: 00 668 92631

FRANCE

PARIS

Le Monde en Tique
Tel: 1 43 25 45 20

GERMANY

AACHEN

Augustinus Fachbuchhandlung
Tel: 0241 27555

BERLIN

Berliner Universitätsbuchhandlung am Alex
Tel: 030 2409431
Buchhandlung Klepert
Tel: 030 31 10090
J.F. Lehmanns Fachbuchhandlung
Tel: 030 6179110
http://www.LOB.de

BONN

Buchhandlung Bouvier
Tel: 0228 729010
http://www.books.de

BREMEN

Buchhandlung Storm
Tel: 0421 321523

DUESSELDORF

Buch am Wehrhahn
Tel: 0211 353071

ERLANGEN

Mencke-Blaesing
Universitätsbuchhandlungen
Tel: 0913178060
Rudolf Merkel
Tel: 09131/89050
http://www.merkel.de

FREIBURG

Buchhandlung Rombach
Tel: 0761/4500414
http://www.bookworld.de

FRANKFURT/MAIN

Fachbuchhandlung fuer Informatik und Elektronik
StaaK & Beirich GmbH
Tel: 069/280225
Harri Deutsch GmbH
Fachbuch & Antiquariat fuer
Naturwissenschaften und Technik
Tel: 069/775021
http://www.Germany.Eu.net/
Shop/HD/

HAMBURG

Boysen & Maasch
Tel: 040 3020702
http://www.boysen-maasch.de/
J.F. Lehmanns Fachbuchhandlung
Tel: 040 336384
http://www.LOB.de

HANNOVER

Decius Softshop/Weidemanns
Technik-Buecher
Tel: 0511 365780
Schmorl & von Seefeld
Tel: 0511 36750

HEIDELBERG

Buchhandlung Gustav Braun
Tel: 06221/14720
Koesters Akademische Buchhandlung
Tel: 06221/20669

KARLSRUHE

Kellner & Moessner
Universitätsbuchhandlung
Tel: 0721/388001
Buchhandlung am Kronenplatz
Tel: 0721/37775

KOELN

Buchhaus Gonski
Tel: 0221 209090
http://www.books.de
J.F. Lehmanns Fachbuchhandlung
Tel: 0221 428153
http://www.LOB.de
V.U.B. Vereinigte Universitäts- und
Fachbuchhandlung
Tel: 0221 207920

MAINZ

Johannes Gutenberg-Buchhandlung
Dr. Josef A. Kohl
Tel: 06131/387011

MANNHEIM

Loeffler Fachbuch
Tel: 0621/810000
e-mail: info@loeffler.de

MUENCHEN

Universitätsbuchhandlung August
Lachner
Tel: 089/521340
Byteschriften
Tel: 089/288333
http://www.sspace.net/byteschriften/

MUENSTER

Buchhandlung Regensberg
Tel: 0251 490160

NUERNBERG

Buchhaus Campe
Tel: 0911/9920823

STUTTGART

Buchhaus Wittwer
Tel: 0711/25070

WIESBADEN

Forum, Medien-Handel AG
Tel: 0611/17350

WUERZBURG

Fachbuch Neuer Weg
Tel: 0931/355900
e-mail: fachbuch@
neuer-weg.mailbox.de

GREECE

ATHENS

G.C. Eleftheroudakis
Tel: 0 1 3222255
Kleidarithmos
Tel: 0 1 3629629
Papasotihiou
Tel: 0 1 3841826

PATRAS

Maria Hatzioannou
Tel: 030 61 272072

THESSALONIKI

A. Malliaris-Paedia S.A.
Tel: 030 31 278707
John Mihalopoulos & Son
Tel: 030 31 279695

HOLLAND

AMSTERDAM

Scheltens Hakkema Vermeulen
Tel: 020 5231411
VU Boekhandel
Tel: 020 644355
WH Smith
Tel: 020 6383821

BREDA

Gianotten Breda
Tel: 076 5149700

DELFT

Technische Boekhandel Wiltman
Tel: 015 2123775
e-mail: info@wiltman.nl
TU Boekhandel Prins
Tel: 015 2131551
e-mail: TU-prins@
www.boeknet.nl

DEN HAAG

Boekhandel Verwijs
Tel: 070 3639718
Boekverkoopers Van Stokum
Tel: 070 3656808

EINDHOVEN

Van Piere Boeken
Tel: 040 2444045
TU Boekhandel
Tel: 040 2442439

GRONINGEN

Scholten's Wristers
Tel: 050 3139788

LEIDEN

Boekhandel Kooiker
Tel: 071 5160500
Ginsberg Boekverkoopers
Tel: 071 5124642

MAASTRICHT

Standaard Boekhandel
Tel: 043 3210825

NUMEGEN

Dekker van de Vegt
Tel: 024 3221010

ROTTERDAM

Donner Boeken, Lijnbaan
Tel: 010 4132070
Donner Boeken, Burgemeester
Oudlaan
Tel: 010 4081150

SITTARD

Dekker van de Vegt
Tel: 046 4528100

TILBURG

Gianotten Tilburg, Emmapassage 17
Tel: 013 4651111
Gianotten Tilburg,
Prof. Verbernelaan 100
Tel: 013 4682991

UTRECHT

Broese Kemink
Tel: 030 2313804
http://www.drm.nl/
bedrijven/broese
Wristers Boekverkoopers
Tel: 030 2333204

WAGENINGEN

Kniphorst Boekverkoopers
Tel: 0317 424242

ICELAND

REYKJAVIK

Boksala Studenta
Tel: 056 15961

LUXEMBOURG

Promoculture
Tel: 02 4806911

MALTA

SLIEMA
Audio-Visual Centre
Tel: 030896

NORWAY

BERGEN

Studia
Tel: 055 54 52 10

TRONDHEIM

Tapir
Tel: 073 59 32 26

OSLO

Akademika
Tel: 022 85 30 80
Jual Moller
Tel: 022 41 19 00
Claf Norlis
Tel: 022 42 91 35

SWEDEN

LINKOPING

Akademi Bokhandel
Tel: 013 10 37 58

STOCKHOLM

Akademibokhandeln-City
Tel: 08 613 61 00
Teknisk Hoegskolelittertur
Tel: 08 21 46 80

SWITZERLAND

BERN

Stauffacher AG
Tel: 031 311 2411

GENEVA

Ellipse Librairie
Tel: 022 731 5878

LAUSANNE

Payot Librairie
Tel: 021 341 3331

ZURICH

Freihof AG
Tel: 01 363 4282
http://www.eunet.ch/freihof/
Buchhandlung Enge AG
Tel: 01 287 9570
e-mail: enge70@access.ch

UNITED KINGDOM

ABERDEEN

Blackwells, Upperkirkgate
Tel: 01224 644528
Dillons, Union St
Tel: 01224 210161

AYLESBURY

Dillons, Friars Square
Tel: 01296 23153

BELFAST

The Bookshop at Queen's
Tel: 01232 333602

BIRMINGHAM

Dillons, Aston University
Tel: 0121 359 3242
Dillons, New Street
Tel: 0121 631 4333

BRIGHTON

Blackwells, Bond Street
Tel: 01273 329012
Dillons, North Street
Tel: 01273-206017
Sussex University Bookshop
Tel: 01273 678333

BRISTOL

Blackwells, Park Street
Tel: 01179 276602
Blackwells
Univ. of West of England
Tel: 0117 965 2573

CAMBRIDGE

Dillons, 20 Sidney Street
Tel: 01223 351688
Heffers, Trinity Street
Tel: 01223 568568
Waterstones, Bridge Street
Tel: 01223 300123

CANTERBURY

Dillons, University of Kent
Tel: 01227 462450

CARDIFF

Blackwells University Bookshop
Tel: 01222 340673

CRANFIELD

Student's Bookshop
Tel: 01234 754280

CRAWLEY

Dillons, County Mail
Tel: 01293 533471

CHELMSFORD

Clarke's, Exchange Way
Tel: 01245 355321

DERBY

Dillons, University of Derby
Tel: 01332 331719

DUBLIN

Hodges Figgis, Dawson St
Tel: 016774754
Waterstones, Dawson St
Tel: 016791415

DUNDEE

Blackwells University Bookshop
Tel: 01382 322184
James Thin, High St
Tel: 01382 223999
Waterstones, Commercial St
Tel: 01382 200322

EDINBURGH

James Thin, Southbridge
Tel: 0131 556 6743
Waterstones East End
Tel: 0131 556 3034
Waterstones, George St
Tel: 0131 225 3436
Waterstones West End
Tel: 0131 226 2666

EXETER

Dillons, High Street
Tel: 01392 423044

GATESHEAD

Waterstones, Metro Centre
Tel: 0191 493 2716

GLASGOW

John Smith & Son (Glasgow) Ltd at
Glasgow University
Tel: 0141 334 1210

Strathclyde University

Tel: 0141 552 3377
57 Vincent Street
Tel: 0141 221 7472
Waterstones, Union Street
Tel: 0141 221 0890

HATFIELD

Dillons, The Galleria
Tel: 01707 270161

IPSWICH

Waterstones, Buttermarket
Tel: 01473 289044

LEEDS

Waterstones, 93-95 Albion Street
Tel: 0113 244 4588

LEICESTER

Dillons, Market Street
Tel: 0116 2545858

LIVERPOOL

Blackwells
Tel: 0151 709 8146
Dillons, Bold Street
Tel: 0151 708 6861

LONDON

Blackwells Business and Law
Tel: 0171 831 9501
Blackwells, Charing Cross Road
Tel: 0171 292 5100
Books Etc, Canary Wharf
Tel: 0171 513 0060
Dillons, Gower Street
Tel: 0171 636 1577
http://www.dillons.co.uk
Modern Book Company, Praed Street
Tel: 0171 402 9176
The PC Bookshop, Sicilian Avenue
Tel: 0171 831 0022
W&G Foyle Ltd
113-119 Charing Cross Road
WC2H 0EB
Waterstones, Charing Cross Road
Tel: 0171 434 4291
Waterstones, Leadenhall Market
Tel: 0171 220 7882

LUTON

Student's Bookshop,
University of Luton
Tel: 01582 402704

MAIDSTONE

Waterstones, Earl Street
Tel: 01622 681112

MANCHESTER

Blackwells, Oxford Road
Tel: 0161 274 3331
Waterstones, Deansgate
Tel: 0161 832 1992

MIDDLESBOROUGH

Waterstones, Cleveland Shopping
Centre
Tel: 01642 242682

MILTON KEYNES

Dillons, 51-53 Silbury Arcade
Tel: 01908 696260
Student's Bookshop,
570 Silbury Arcade
Tel: 01908 607454

NEWCASTLE

Dillons, Emerson Chambers
Tel: 0191 261 7757

NORWICH

Jarrolds, London Street
Tel: 01603 660661

NOTTINGHAM

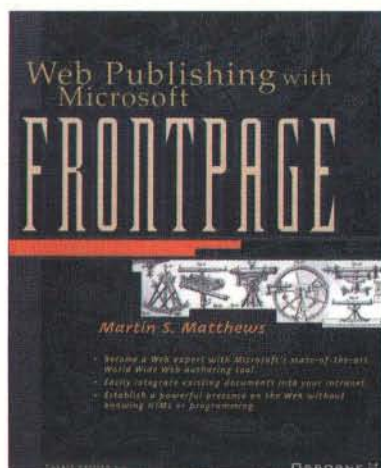
Blackwells, Nottingham Trent
University
Tel: 0115 9417307
Dillons, Wheeler Gate
Tel: 0115 9473531

OXFORD

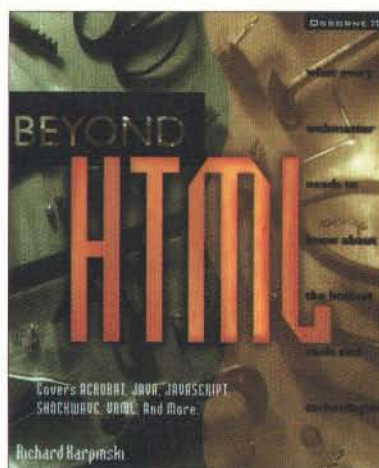
McGraw-Hill for

RAW SKILL

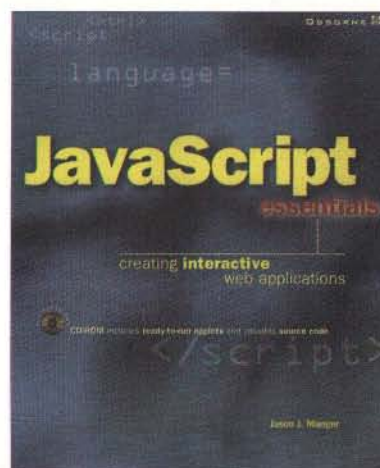
Five hot hits for the World Wide Web



Web Publishing with Microsoft FrontPage
by Martin S. Matthews
ISBN: 0-07-882224-6



Beyond HTML
by Richard Karpinski
ISBN: 0-07-882198-3

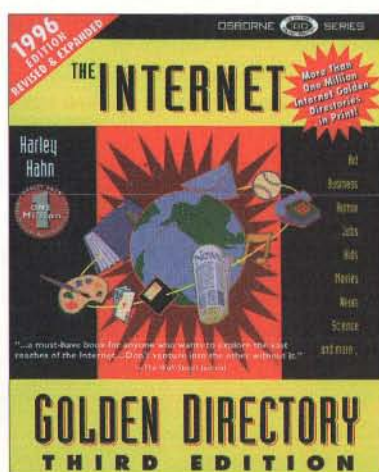


JavaScript Essentials
by Jason J. Manger
ISBN: 0-07-882234-3

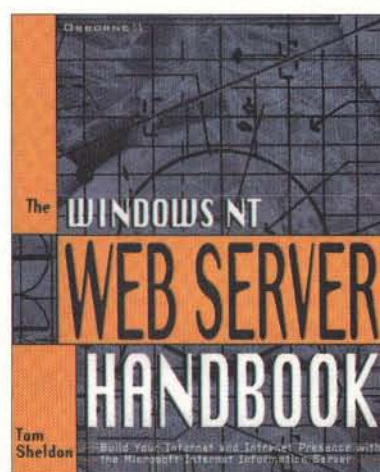
FREE!



Visit your local bookshop and check out the latest range of Osborne/McGraw-Hill Internet books and pick up your copy of *Raw Information*, the **Free** computer books newspaper. Now available from Europe's leading bookshops - see opposite page for list!



The Internet Golden Directory
by Harley Hahn
ISBN: 0-07-882192-4



The Windows NT Web Server Handbook
by Tom Sheldon
ISBN: 0-07-882221-1



The McGraw-Hill Companies

McGraw-Hill Publishing Company Europe, A Division of the McGraw-Hill Companies • <http://www.mcgraw-hill.co.uk> • <http://www.osborne.com>

Self-Help Software to the Rescue

Call-avoidance software helps companies improve customer support and reduce expenses.

New programs for the Web let beleaguered technical-support departments reduce costs and improve service by helping users help themselves. Tech-support calls are the bane of the computer industry. They cut into profits—as much as \$20 per call—and often make frustrated users wait, usually at their own expense. To reduce the number of support calls a help desk has to field, companies are turning to a new breed of product known as call-avoidance software.

Expert systems are not new: Companies have used them for years to help their support personnel find solutions more quickly. The new trend is to put answers directly into the hands of the user, potentially bypassing the tech-support phone call altogether. And the new vehicle for delivering that knowledge is—you guessed it—the Web.

"Call-avoidance programs such as our Web Advisor and Knowledge Builder won't solve every problem out there," says Keith Loris, vice president of development at ServiceSoft (Needham, MA), which recently released its first authoring tools for building Web-based problem-solving systems. "But they can reduce the number of phone calls a tech-

Cases to Consider		Clarifying Questions	
Scores	Cases	Questions	Answers
96	Laser print quality: variable print density down the page - contacts on image receptor dirty	When was the image receptor replaced last?	Not answered
81	Laser print quality: residual images - image receptor is worn out	Is the print density control already set at maximum?	Not answered
77	Laser print quality: grey print - image receptor worn out	Does the print density control appear to be set more than half way (too high)?	Not answered
71	Laser print quality: large interval regularly spaced spots - surface of image receptor damaged	Has it been a while since preventive maintenance has been applied to this printer?	Not answered
64	Laser print quality: residual images - print density set too high	Can you see toner particles or paper dust in the transfer ion rod area?	Not answered

Programs developed with ServiceSoft's tools provide users with several possible solutions, with the most likely presented at top.

nical-support department has to handle. They can also ensure that the answers users get are consistent."

Some call-avoidance software goes a step beyond telling users how to fix a problem: Instead, the program fixes the problem automatically. For example, SystemWizard, from SystemSoft (Natick, MA), will detect, diagnose, and, in some

cases, automatically fix common PC problems. SystemWizard, which should start appearing in several vendors' Win 95 and NT PCs by the end of this year, comprises several components, including a client application with a built-in local knowledge base of problem/resolution data, a server that provides a second level of support, and a knowledge

geek mystique

By our count, viewers watching the Summer Olympics on TV were, on one night, inflicted with 91 ads between 8 p.m. and midnight. Of those 91 ads, seven (about 8 percent) listed Web addresses. The Web-aware advertising companies were Reebok, Kodak, NBC, and Xerox and IBM (both twice). The next day, in the Boston Globe, we count-

ed 121 display ads, six (5 percent) of which had Web addresses.

— Jason Krause

Other Web Statistics

- Estimated percentage of adults in the U.S. using the Web: 7.7
- Estimated volume of sales generated by the World Wide Web in 1995 (in millions of dollars): 436
- Projected sales to be generated by the Web in 1998 (in millions of dollars): 46,000
- Number of U.S. states with organized pro-

grams for schools on NetDay '96: 27

- Number of Internet service providers worldwide (as of July): 3054
- Estimated size of Internet access market in 1997, in billions of dollars: 2.5
- Proposed tax on Internet access providers serving Tacoma, Washington: 6 percent
- Number of U.S. states taxing on-line services: 6
- Number of domains in .COM: 316,271
- Number of private Internet providers in Egypt: 7

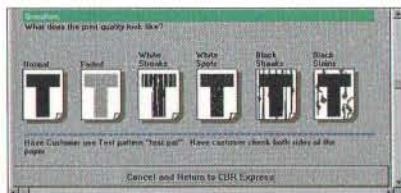
— Win Treese

builder for use by a PC vendor or MIS department to add solutions as new problems occur. If System Wizard doesn't find a solution in the local database, the program can dial up a server, either over the Internet or the phone lines. The server can also automatically fix the problem by downloading a software solution or making some other modification.

By including a prebuilt database of solutions in System Wizard, SystemSoft also eliminates a potential drawback to expert systems: the amount of time required for an organization to develop a comprehensive help system.

"Authoring is clearly the biggest issue," says Keith Sturdivant, manager of advanced support technology at Microsoft, which is increasing the number of self-help solutions it puts on the Web. "Maintaining the content and ensuring that the information is accurate and current in the database is important. And if you have a broad range of issues to address, as we do at Microsoft, that becomes much harder to deal with."

One difficulty is that technical-support people are often too busy solving the latest customer problem to sit down for half a day or even an hour to get information out of their brain and into the



Problem resolution can be more visual than with a phone call, as shown in this application using Inference's Casepoint.

expert system. Writing a self-help program that solves problems for people who have little or no inkling about what is causing their technical difficulties still involves extensive work, even when using authoring tools that require little or no programming.

"Providing a solution for a user who

WEB SELF-HELP SOURCES

Advantage kbs:
(908) 287-2236; <http://www.akbs.com>
Inference:
(415) 893-7200; <http://www.inference.com>
ServiceSoft:
(617) 449-0049; <http://www.servicesoft.com>
SystemSoft:
(508) 651-0088; <http://www.systemsoft.com>

yeah, but...

A controversy swirling around the release of NT 4.0 involves Microsoft's limiting to 10 the number of computers that can connect simultaneously to NT Workstation. To support more than 10 people, you have to use the more expensive NT Server, which sells for about \$1100. Microsoft officials say they are justified in this practice, since they have not tested NT Workstation to ensure it can support heavy usage (for example, as an Internet Web server).

Yeah, but this practice puts other vendors of Web server programs at a disadvantage. Microsoft provides a free Web server program with NT Server. Microsoft's 10-user licensing restriction essentially prevents other vendors from selling Web software that runs on the less expensive (\$319) NT Workstation at an overall cost that's less than NT Server. Competing on the NT Server field means Microsoft's competitors have to play against a free product.

Microsoft can put whatever restrictions it wants on its products. If people want to use NT to host Web sites, they can upgrade to NT Server.

Yeah, but Microsoft's policy will make customers who want to use NT as a platform for Web servers pay more. And other vendors say NT Workstation easily supports more than 10 users connected simultaneously to a Web site. They also argue that Microsoft already backed down from its plan to build the 10-user limitation into the NT Workstation software. But then why did Microsoft reintroduce the limitation by putting it into its licensing agreement?

doesn't have any idea what's wrong requires pretty intense authoring," says Erik Stackhouse, technical-support representative at Internet service provider UltraNet (Marlboro, MA), which is currently developing solutions using authoring products from ServiceSoft. "In that situation, you have to ask the user a lot of questions. There are so many factors involved that, from an authoring standpoint, it might be more work than it's worth." This is why companies such as UltraNet often start with a self-help system that specifically addresses a subset of common problems that can be easily solved, usually by an intermediate or advanced user. Situations involving more complex questions, novice users, or a computer that can't even get onto the Net will still require a voice call.

But even if the first implementations of Web-based self-help systems divert only 20 percent of incoming tech-support calls, this would be a huge improvement. And many vendors say that after an initial pilot phase, they plan to roll out larger, more comprehensive applications that will eventually handle 50 percent or more of incoming calls. In those situations, it's critical that call-avoidance authoring tools be able to integrate with legacy problem/resolution databases and call-tracking programs. And here the Web may again play an important role. A browser can be a single access point to a

myriad of data sources, provided those databases can export into the Hypertext Markup Language (HTML) format. "If you're making the effort to author, you want it to be accessible to as wide an audience as possible," says UltraNet's Stackhouse. "Doing it on the Web is probably the best way to make this work on a large scale."

— Dave Andrews

Contents

New Face of Security
30

Aerial Telecommuting
30

Dirt-Cheap Color Printers
36

Unix Survey
42

Network Cameras Go Mobile
44

Entomophagous
Bruce Brown
48

Microsoft Internet Explorer 3.0



Microsoft Internet Explorer

Special Offers

-  The Wall Street Journal Interactive Edition
-  ESPN[®] SportsZone
-  Hollywood Online
-  MTV Online
-  InvestorsEdge
-  And more!

SPECIAL

MUT
FUN

Quarterly

THE WALL

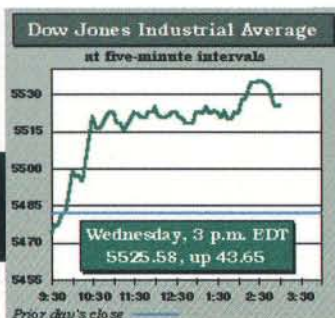
*Connect time charges may apply to all offers.

©1996 Microsoft Corporation. All rights reserved. Microsoft is a registered trademark and the Microsoft Internet Explorer logo and *Where do you want to go today?* are trademarks of Microsoft Corporation. The Wall Street Journal[®] Interactive Edition is a trademark of Dow Jones & Company, Inc. ESPN[®] is a trademark of ESPN, Inc. SportsZone is a trademark of Starwave Corp. MTV is a trademark of MTV Networks, a division of Viacom International, Inc. Hollywood Online is a trademark of Hollywood Online Inc. InvestorsEdge ©1995 Ethos Corp.

IS YOURS TO DOWNLOAD, ABSOLUTELY **free**,
 COMPLETE WITH **subscriptions**
 TO THE WALL STREET JOURNAL INTERACTIVE
 EDITION AND ESPNET SPORTSZONE,
also free.

SPORT
 AL
 S
 view

STREET JOURNAL.
 INTERACTIVE
 EDITION.



Introducing Microsoft® Internet Explorer 3.0. The new browser that's a step ahead of all the rest. It lets you experience all the coolest content, like sound and animation, that's being developed for the Internet today. It lets you customize the way you access and view the web. And it's yours to download right now, absolutely **free**.* From now through December 31, we have all kinds of special offers that make the experience even better: You get The Wall Street Journal® Interactive Edition, free. It's the web's leading source of business news, with 24-hour updated coverage of world business and deep background on thousands of companies and

topics. You also get a free subscription to the premium areas of ESPNET™ SportsZone,™ the number one destination site on the web, including expert columnists, multimedia highlights, behind-the-scenes reports, in-depth player profiles, and more. Our new browser also gives you free access to "buy, sell, hold" stock recommendations from InvestorsEdge, the Internet's premier financial information service. And there's even special content on MTV™ Online and offers on other sites that can only be seen with it. Just go to www.microsoft.com/ie. Then click one button. And see what a real browser can bring you these days.

Microsoft®

Where do you want to go today?

www.microsoft.com/ie

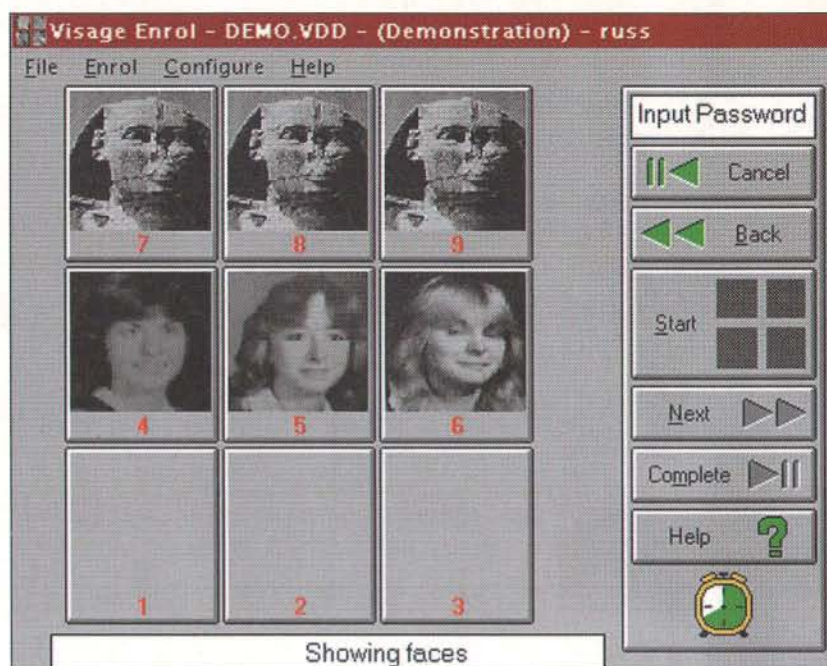
Security Gets a New Face

Here's a twist on security that gives new meaning to the word "facetime." The old definition of facetime involves trying to remember people's names as you mingle at parties. But for the U.K. company Visage Development, facetime refers to an authentication mechanism that requires users to recognize a series of faces before they can access their computers.

Instead of asking a user to remember a password or carry an authentication token, the Visage program presents a row of three faces, some of which the user has learned to recognize. Faces are typically 16-level gray-scale images, 50 pixels square, and each has a number. The faces appear for about a second before they're covered up by a masking image that hides the pictures from bystanders. Then another row of faces appears for a second and is covered up. Finally, a third row (see the screen shot at right). The user types in or clicks on the three numbers of the faces recognized; this is verified, and access is granted or denied.

The faces are taken from a database of generic faces. Each time, the three key faces appear in different positions, and the surrounding faces are randomly selected from the rest of that database.

Visage requires an initial training period of five to 10 minutes, during which the user chooses three faces from the image database, then practices recognizing those faces. What's innovative about Visage is that it's a genuine one-time password that requires no extra hardware, does away with password changes and the attendant administrative hassles, and is easier than ever for users. No smart cards, no challenge-response number pairs, and no fingerprint readers are



Visage asks users to recognize faces, rather than remembering personal identification numbers.

required. In one test, a user who left on maternity leave returned six months later and was able to successfully log in right away. Tests conducted by University of Cardiff psychologist Hadyn Ellis have verified the reliability and recallability of facial recognition as an authentication mechanism. Another test involved one group of people using Visage and another using personal identification numbers (PINs). After three months of no usage at all, the subjects were tested on their recall: Faces scored 100 percent, PINs 0.

The strength of Visage is based on our ability to recognize a face almost instantly (i.e., in about 20 milliseconds), combined with our inability to describe it in words that would let someone else pick out that same face from a group of simi-

lar ones. Also, the number of faces displayed per row, the number of rows in the grid, and the number of matches required, can all be configured to individual situations. Asking the user to pick three faces from five rows of four faces each and then to repeat with a new grid provides enough security to meet the standards of the British Computer-Electronics Security Group.

The company (contact William Visick, +01442 230471; fax +01442 212142; bvisick@cis.compulink.co.uk) is primarily interested in licensing the Visage technology, not in developing user-level products itself. Visage is currently available for NetWare 3 and 4, and a Windows NT version is nearing completion.

—Russell Kay

Coffee, Tea, or FTP?

Communications for air travelers in the future won't be so disconnected or rely so heavily on battery-powered notebooks. Delta Air Lines (Atlanta, GA), in partnership with Olin Aerospace Company (Redmond, WA), has already begun testing its first in-seat power supply system. Passengers on the airline's Spirit of Delta

Boeing 767 can sit down, plug in their computers, and not worry about battery power. Other airlines are also evaluating similar in-flight power systems.

Further out are communications systems that would let airplane passengers browse the Web

live. Systems such as Airview, from a company called The Network Connection (Alpharetta, GA), combine video entertainment, catalogs, PC games and applications, and possibly Web access. With Web access, travelers could send e-mail or browse competi-

tors' sites. However, before live Web access is possible, the satellite network that planes currently use for in-flight phone and fax services will need upgrading. And there's another matter. "Before deploying any next-generation communication system," says a spokesman for United Airlines, "we're going to take a close look at how much weight they add to the airplane." —DA

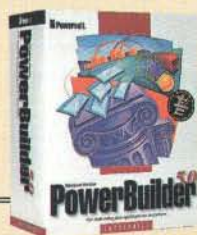
future watch



Netscape Plug-ins and Web Server Objects. Get ready to launch dynamic business applications out on the World Wide Web with PowerBuilder 5.0.

Now you can use market-leading PowerBuilder® 5.0, together with Powersoft's new web.pb™ to build real-world applications that run on any Web server, access corporate data with our patented DataWindow™ technology, and generate HTML on the fly for your favorite Web browser.

What's more, PowerBuilder 5.0 lets you create applications that run as Netscape Plug-ins for any Plug-in compatible browser. And since



Visit us at www.powersoft.com and you may win free products or other great prizes.

PowerBuilder 5.0 supports ActiveX controls, you can extend your applications' reach even further with new Internet components.

So "Web-ize" your applications today with PowerBuilder 5.0. It's available in three editions: Desktop, Professional, and Enterprise. To explore it at one of our seminars or to get more information, call us at 1-800-395-3525. And get ready to send your PowerBuilder applications into orbit.



Powersoft

web.pb for Web Server Development

Window Plug-ins

DataWindow HTML Generation

ActiveX Support

Multi-Tier Application Partitioning

Compiled Code

Designed for Windows® 95

ObjectCycle™ for Version Control

Native Database Drivers

Foundation Class Library

©1996 Sybase, Inc. All rights reserved. Powersoft, PowerBuilder, web.pb, DataWindow, and ObjectCycle are trademarks of Sybase, Inc. or its subsidiaries. All other trademarks and registered trademarks are property of their respective owners. (508) 287-1500. <http://www.powersoft.com>

Vendors Battle Over Next Internet File System

Browser wars, step aside. The next battle looming in cyberspace is over which file system will provide the underpinnings for better file transfer and group collaboration services on the Internet. Such a file system, whether from Sun or Microsoft or some other vendor, would improve upon the Internet's current HTTP and FTP.

Sun's proposed new standard, the Web Network File System (WebNFS), is just what the Web needs, claims Brian Croll, director of marketing for Solaris Servers at Sun. "The Internet is like a dirt road with a lot of potholes. One of these potholes is the slow speed of file transfers," Croll says. An advantage of WebNFS is its superior performance over FTP and HTTP for transferring large blocks of data, Sun says. WebNFS also lets you edit documents instead of simply viewing them as you do in today's browsers. This read/write capability will allow vendors to develop applications that let you collaborate with others from within your Web browser or Web-enabled application, without having to cut and paste text from the browser into another program.

Sun's NFS has been the TCP/IP file distribution standard for more than a decade. Not tied to any architecture or operating system, NFS is the glue that holds together heterogeneous file sys-

tems. Until recently, there hadn't been an open implementation that would work consistently over Internet connections. But with Sun's submission of WebNFS to the Internet Engineering Task Force as a proposed open standard, that's no longer true.

WebNFS springs ahead of the Net's hypertext (HTTP) and data transfer (FTP) protocols because neither of them are network file systems. HTTP must constantly close and open sockets to transfer information, and both HTTP and FTP require high latency between packets. WebNFS cuts down on both the inter-process communication and latency factors. This results in WebNFS offering block file transfers that are up to 10 times faster than the current versions of HTTP and FTP, Sun claims.

WebNFS already has powerful supporters, including Oracle and Spyglass, who are incorporating it into their browsers. Auspex, IBM, and Sequent plan to include WebNFS in their Web servers. Sun, of course, is putting all its resources behind WebNFS. The most visible sign of this support is the Netra NFS file servers, which depend as much on WebNFS as they do on HTTP for data transfer.

However, two prominent names are missing from the list of WebNFS adopters: Microsoft and Netscape. HTTP and FTP leave much to be desired for seeking, reading, and writing operations, agrees J Allard, a program manager at Microsoft. But Microsoft's remote file access protocol, called Common Internet File System (CIFS), complements HTTP. CIFS is based on the company's service message blocks (SMBs), which are

already used in existing network components of Windows and NT, Allard notes, as well as on Unix.

Allard finds Sun's WebNFS speed claims to be somewhat disingenuous. "Byte Read-Range and HTTP connection keep-alive is evolving HTTP into a rival for WebNFS," he says. According to Allard, it may be too late to expect the entire Internet community to make a fundamental shift from HTTP to a new standard for file transfers.

Netscape, usually a staunch Sun ally, is still evaluating WebNFS, according to Andreas Cook, product PR manager. "Even if we turn it down now, we may use it in the future," he says.

"The big powers of the Web will fight over WebNFS. If Sun is successful, adding WebNFS will require many companies to retrofit their servers and browsers," says Ross Rubin, senior analyst for Jupiter Communications (New York City), a research firm that covers consumer online services and the Internet.

WebNFS is a threat to Netscape, says Stephen Auditore, president of Zona Research, an Internet market research house. "WebNFS plus Java is a direct competitor to HTTP and HTML," he says. "If Sun is successful in replacing the existing infrastructure, all the other major Web companies are in serious trouble." According to Auditore, Netscape is balking because WebNFS/Java would undercut all its technology dollars.

As for Microsoft, "Redmond already has its own distributed file system oriented to the NT environment and SMB, and they would love to see it expanded onto the Net," Auditore says. After all, whichever company controls the standards also controls the marketplace: WebNFS's success or failure could drastically influence Sun's and other companies' revenue streams.

Will WebNFS become the Net standard? "A lot will depend on whether Sun can gain the mind share of people using other third-party HTTP servers," says analyst Rubin. "If someone ports WebNFS to popular freeware servers, like Apache, it will be a matter of time until people start hacking together WebNFS add-ons for both Netscape's and Microsoft's browser and server product lines." If that happens, then the Web could be completely reinvented with WebNFS as its standard.

— Steven J. Vaughan-Nichols

Bug of the Month

cc:Mail: Not OK

A BYTE editor found this interesting dialog when attempting to read new e-mail using cc:Mail 2.01 under Win 95. After the editor logged in, cc:Mail announced that he had new mail. When the editor attempted to read the new e-mail, the dialog message at right appeared. When he attempted to close the dialog box, he got the dreaded ringing-bell error sound. Clicking on another application minimized the dialog, and

attempting to read cc:Mail caused another instance of the same error message. Now bells were ringing in stereo. The quick-and-dirty solution:

Close cc:Mail and all other applications, reboot, and try again. The next time, everything worked as expected.



Send yours to edejesus@bix.com!

"They thought my new Multipath™ Back-UPS® Office™ was just a big surge suppressor – then the lights went out."

Back-UPS Office's Internet Ready Fax/Modem Protection prevents surges from damaging internal & external modems, motherboards, input/output cards, and other system components.

Circuit breaker provides protection in the event of an overload or short circuit; no fuse, no hassle.

Recessed Master On/Off Switch prevents accidental shut-offs and conveniently controls power to the entire connected system.

Convenient BlockSafe™ outlet spacing can accommodate all size plugs, including large transformer blocks.

Full Time Surge Protection

Battery Power Supplied

Check Battery

Change Battery

Emergency Warning Tack

LIFETIME EQUIPMENT PROTECTION \$25,000

FOR AS LONG AS YOU OWN THE PRODUCT, IF YOUR POWERED EQUIPMENT SUFFERING IS FULLY COVERED BY AN AC SURGE, INCLUDING DAMAGE TO THE EQUIPMENT, APC WILL REPAIR OR REPLACE THE PRODUCT AND UP TO \$25,000 OF COVERED EQUIPMENT AND DATA FOR RETAIL VALUE IN U.S. AND CANADA ONLY.

Guaranteed protection against all power problems, on all power paths, for PCs and peripherals.

Back-UPS Office has User-replaceable Batteries that can be easily swapped out, saving time and expense; no need to return to the factory for service. Batteries last 3-6 years under normal usage.

Six outlets guard your hardware with full-time surge protection. Three of the six outlets provide instantaneous battery back up to keep your system from crashing in the event of a brownout or blackout.

At last, a safe place to plug everything: Multipath Back-UPS Office for workstations, PC's and peripherals



Facing the darkness is hard, but inevitable: You have a better chance of winning the lottery than of escaping power problems: They're the single largest cause of computer data loss and hardware damage.

Back-UPS Office provides reliable power for your entire system. Instantaneous battery backup ensures uninterrupted operation of your CPU, monitor and an external storage device. Full-time surge suppression and site-wiring fault protection spreads a true Multipath™ safety net under any remaining integrated peripherals, like modems, printers, faxes and phone systems. Back-UPS Office also provides convenient BlockSafe™ outlet spacing to handle all size plugs – even large block transformers.

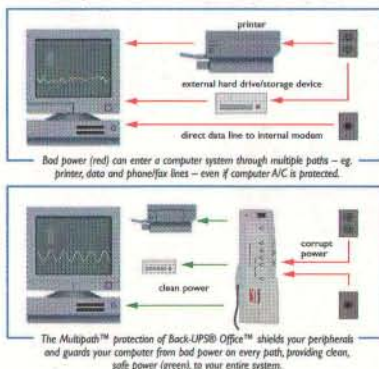
Unique Multipath protection keeps your PC and data safe

Plugging a phone line into your computer doubles your vulnerability to power



problems; add any peripheral, and it triples. Even if your AC power-line is shielded, when a surge hits an unprotected peripheral, it can blaze down serial and data lines, and toast your expensive PC.

Multipath™ Means Total Power Protection



Multiple peripherals and data lines to and from your system are vital, but dangerous. Without them, you can't do your job. However, if a power sag makes your modem drop the line while you're downloading from the Internet, or locks your keyboard before you've saved work, you lose time, money and spend another late night at the office to meet your deadline.

Back-UPS Office protects your entire system

Until now, protection for your entire system required several devices. But multi-device protection can leave you vulnerable to line noise and unwanted data glitches created by the voltage differential between outlets. Those glitches are prevented with the Back-UPS Office common voltage reference.

Back-UPS Office means true Multipath™ protection, clean, safe power to every

peripheral, and instant battery backup to keep your cutting edge system and OS from crashing. It means protection for less by integrating the security of a surge suppressor with the power of a UPS, guaranteed up to \$25,000.

APC has won more awards for reliability than all other brands combined



"Back-UPS Office [is] a sho-in for the small-office/home-office computing market and for general desktop workstations."
-Computer Reseller News

THE MULTIPATH POWER PROTECTION ADVANTAGE	TRADITIONAL SURGE PROTECTION	TRADITIONAL UPS	BACK-UPS OFFICE
Protected Paths:			
AC	+	+	+
Data	+	+	+
Phone	+	+	+
Total Outlets	7	3	6
Number of Block Outlets			2
Protection Items:			
Surge	+	+	+
Spikes	+	+	+
Blackouts	+	+	+
Brownouts	+	+	+
Overvoltage	+	+	+
Typical Runtime in Minutes:			
with Pentium 100 w/15" monitor		10	10
Battery backup for:			
Printer	+	+	+
Storage Devices/Tape Drives	+	+	+
Full-time surge protection for:			
Fax/Modem	+	+	+
Laser Printer	+	+	+
Speakers	+	+	+
Additional protection for:			
Internet or Network			+

Traditionally, protecting all your equipment meant buying a surge suppressor and a UPS. Even then, only your AC line was protected. New Back-UPS Office protects all paths to your equipment. Bulletproof Multipath protection.

Protect yourself before you kick yourself. Get your new Back-UPS Office today (list price: \$179.99), or call APC for a FREE 60-page catalog!

APC

AMERICAN POWER CONVERSION

(800)800-4APC • <http://www.apcc.com>

(401)788-2797 Fax • (800)347-FAXX PowerFax
CompuServe: GO APCSUPPORT • Email: bloffice@apcc.com
132 Fairgrounds Road, West Kingston, RI 02892 USA

Dept. A2

Circle 123 on Inquiry Card.

**PICTURE THIS:
6X CD-ROM,
11.3" DISPLAY AND
ZOOMED VIDEO.**

**NOW
PICTURE THIS:
\$2499.[†]**

**ZOOMED
ZV
VIDEO**

FULL-MOTION VIDEO
With Toshiba's Zoomed Video technology and a ZV PC Card, you get full-screen, full-motion video and MPEG support without sacrificing system performance.

11.3"
dia.

800 x 600 RESOLUTION
Sure, the screen is huge. And it also has 800 x 600 resolution, which means that every inch of viewing area delivers crystal-clear definition and vibrant colors.

PENTIUM® PROCESSOR

A 100MHz Pentium processor and 40MB of EDO memory can speed up any multimedia presentation. Plus, the 2.9v processor was designed specifically to maximize notebook battery life.

EXPANSION

Satellite Pro's two PC Card slots unlock a world of expansion capabilities. And the optional NoteDock™ I Enhanced Port Replicator offers additional PC Card slots as well as easy connection to your desktop setup.

ADVANCED MULTIMEDIA
With a 6X CD-ROM, microphone, speaker and stereo headset, Satellite Pro offers the most advanced multimedia features you can get at this price.



INTRODUCING THE NEW SATELLITE PRO.™ When it comes to multimedia features, the Satellite Pro offers the big picture at a small price. It all starts with a huge display and full-motion video to make your multimedia presentations look more like feature films. And it's easy to take your show on the road with a 100MHz Pentium processor, up to 40MB of memory and a massive hard drive. Add to that a 6X CD-ROM, integrated AC adapter and PC Card slots and you've got

more than you need to get the job done. So when you want some real portable power, pick up the Satellite Pro. No other notebook can give you so much for so little. For more information visit the Toshiba website at <http://computers.toshiba.com>, or for a dealer near you, call 1-800-457-7777.



Satellite Pro™

420CDT *

- 11.3" dia. color active-matrix TFT display
- 1.3 billion byte (=1.26GB) hard drive**

420CDS *

- 11.3" dia. color dual-scan DSTN display
- 810 million byte (=772MB) hard drive

BOTH MODELS

- 100MHz (2.9v) Pentium® processor
- 8MB of EDO DRAM expandable to 40MB
- Modular 6X CD-ROM and 3.5" floppy drive, swappable in the SelectBay™
- MPEG support via ZV Port technology (requires optional PC Card)
- HiQVideo™ graphics controller

- 16-bit Sound Blaster® Pro compatible audio system with microphone, speaker and stereo headset
- Two stacked PC Card slots (two Type II or one Type III)
- IrDA compliant
- Lithium Ion battery
- Integrated AC adapter
- Optional NoteDock™ I Enhanced Port Replicator
- Windows® 95 or Windows® for Workgroups included
- 3-year limited warranty
- Toll-free technical support – 7 days a week, 24 hours a day

In Touch with Tomorrow
TOSHIBA

The World's Best Selling Portable Computers.

©1996 Toshiba America Information Systems, Inc. All prices, specifications and availability are subject to change. †Price is for 420CDS model, price of 420CDT model begins at \$3299. *The 420CDT and 420CDS are sold at selected resellers as the 425CDT and 425CDS with Windows® 95 and additional pre-installed software. **The 425CDT comes with an 810 million byte (=772MB) hard drive. All products indicated by trademark symbols are trademarked and/or registered by their respective companies. Intel Inside and Pentium Processor Logos are trademarks of Intel Corporation.

Circle 159 on Inquiry Card.

Photo Quality Arrives for Low-Cost Printers

Ink-jet printers were once the poor substitute for people who couldn't afford a laser printer. Now, these inexpensive devices are delivering much that laser printers can't, including near-photorealistic images at a fraction of the price.

Improvements in ink formulations, dot-placement accuracy, and better software are all combining to produce the best-looking color ink-jet output yet for personal desktops. And the prices are

coming down to staggeringly low levels for this type of output.

An excellent example is Epson's Stylus Color 500C, which puts the company's 720-by-720-dots-per-inch (dpi) output technology in a printer expected to

sell for about \$279. The 500C produces sharp black text, but the real attraction is the photo-quality output. Samples printed on coated stock were as close to conventional photographs as we've seen from a color ink jet, regardless of price. The Epson prints black text at up to 4 pages per minute (ppm) and color at about 1 ppm or slower.

Hewlett-Packard is countering with its midrange model, the 693C. This printer produces laudable photo-quality output in its basic mode, but HP has added an optional (\$49) photo cartridge for even higher-quality output. Inserting the photo cartridge in place of the black ink cartridge produces a much wider range of possible colors, resulting in smoother and better looking output. The results we saw were very impressive, making the HP competitive with the Epson, though it is somewhat more expensive (\$349) and does not come ready to work with a Mac.

Canon's latest iteration of its BubbleJet technology is the BJC-4200, which prints at 720 dpi for crisp, lifelike images. Canon offers specialty neon inks for the BJC-4200, though it has no photo-specific inks like HP. List price is \$399. Canon's BJC-240, also new, sells for \$179, but it's slower than the BJC-4200: 4 ppm in black and white and way under 1 ppm in color.

Lexmark's latest, the Color Jetprinter 2050 (\$299), prints black or four-color output at 600-dpi resolution. The company rates its speed as up to 5 ppm in black and 2 ppm in color. Lexmark offers an accompanying line of special paper for high-quality photographic reproduction.

These color ink jets aren't perfect. They are slower than laser printers when it comes to high-volume black-and-white output, and they can be very slow when producing photo-quality color pages (as much as 3 minutes or more a page). Still, at these prices, they make color printing very affordable.

—Jon Pepper

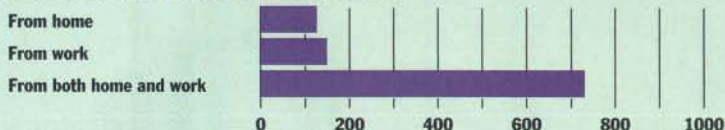
COLOR INK-JET PRINTERS

	Text Speed	Color Speed	Resolution	Cost	Photo Color
Epson Stylus Color 500	4 ppm	2 ppm	720 x 720	\$279	Yes
Canon BJC-4200	5 ppm	1 ppm	720 x 360	\$299	Yes
HP DeskJet 693C	3 ppm	1 ppm	600 x 600	\$349	Yes
LexMark Color JetPrinter 2050	5 ppm	2 ppm	600 x 600	\$299	Yes

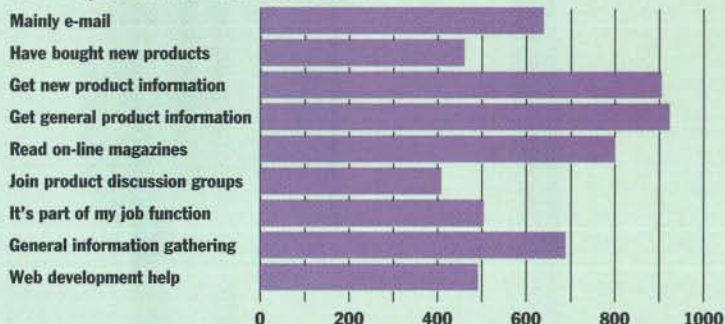
Note: HP and Canon require optional cartridges for true photo color output.

Internet/Intranet Survey

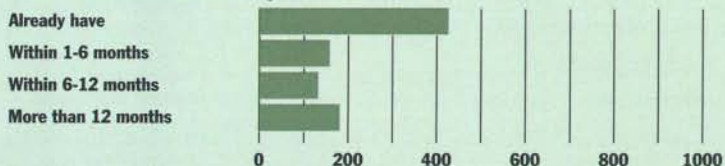
From where do you access the Internet?



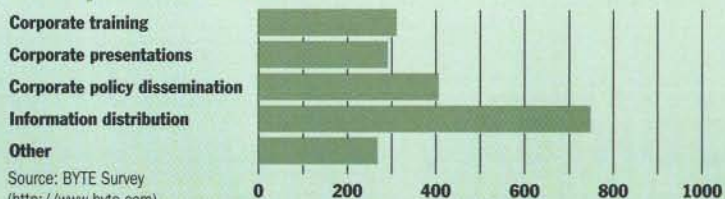
How do you use the Internet at work?



Time frame for intranet implementation



How do you use the intranet?



Source: BYTE Survey
(<http://www.byte.com>)

EXPAND YOUR HORIZONS WITH AMD-K5™ MICROPROCESSOR

AMD is the world's second largest manufacturer of microprocessors. We gave you the first alternative x86 processor. We now add real competition into the fifth generation system market and bring down the cost of personal computing.

The AMD-K5 processors maintain our 100% compatibility with Microsoft® Windows® and Windows95™ software. They are designed to be plug-compatible with industry standard 5-class motherboards.



From single users to large multi-user networks AMD has supplied over 85 million processors to some of the world's best known PC companies. AMD continues to invest in developing processors which will take personal computers into the next millennium.

Take the fast lane to a good investment in PC technology, choose AMD.



Further information on AMD microprocessors is available on telephone:
Germany : 089 450 53198
Italy : 1678 77224
France : 05 90 86 21
UK and rest of Europe : +44 (0) 1276 803121
Please quote : pcd-a13

AMD

Circle 753 on Inquiry Card (RESELLERS: 754).

New Products Make Backing Up Easier

Most PC users look forward to backing up their files about as much as they look forward to a visit to the dentist. They know they have to do it, but they would prefer not to. A new round of products seeks to make the system-backup chore a little less painful.

With its Zip drive, Iomega (801-778-1000; <http://www.iomega.com>) made backup peripherals, if not the process itself, fashionable. With 100-MB data cartridges, a cool design, and the right price (under \$200), the Zip became a best

seller, with a claimed installed base of more than 2 million units. Now, Iomega and others are evolving their backup products into devices that perform a multitude of operations, such as exchanging large data files, archiving, protecting hard drives from viruses, and many other functions. Iomega has followed its 1-GB Jaz drive (\$499) with a new version of its tape-backup line, called the Ditto2GB, that offers an intuitive user interface, 2-GB storage capacity, and \$149 drive price (\$20 per additional tape).

Syquest (510-226-4000; <http://www.sales@syquest.com>), known for its tape backup products, counters with its EZFlyer, a 3½-inch 230-MB removable-cartridge hard drive (\$299). The EZFlyer offers more storage than the Zip, but it's also

more expensive. The media itself is inexpensive at \$29.95. The EZFlyer is available in both parallel and SCSI versions.

Only about 5 percent of PC users currently have some type of backup or archive device, according to Jim Porter, president of Disk/Trends (Mountain View, CA), a market research firm. "It is too early to tell what technology will dominate, but I am inclined to think none will take over a very high percentage of the PC base," Porter says. "It is like life insurance: People don't need it until they are dead, and they feel the same about backup against failures." However, when the dark day comes that your hard drive fails, you will wish you were among the fashionable minority that uses a backup product. **-JP**

Book Reviews

How Free Should Internet Speech Be?

If you believe, as I do, that free speech should prevail on the Internet, you'll find this book a friendly and informative aid the next time you argue this subject. You won't, however, find it a comforting one.

Authors Jonathan Wallace and Mark Mangan take on disturbing denizens of the Net to show why the likes of snuff fiction writers and bomb makers should not be used as excuses for restricting the Internet. Civil-libertarian-minded readers will be chilled to the bone—and their convictions tested—upon reading about the university professor who posted, in an open newsgroup, fantasies of raping and murdering a female student.

Keeping the Net accessible will ultimately place a greater responsibility on all of us to counter that which we find offensive by social, instead of legal, means. In the above case, the authors argue persuasively that prosecuting the professor for conspiracy to commit the acts he'd written about was misguided; more effective and entirely justifiable was his removal by the university from his teaching post.

After an admirable attempt to boil down the legalese of several landmark court cases, the authors conclude that we should treat the Net as a series of printing presses and book stores. They chose this metaphor carefully: A long history of U.S. Constitutional law extends the fullest protection of the First Amendment to those two institutions. In contrast, virtually every advanced communications technology, from telegraph to television, has in some way been restricted by the government.

I found the printing press/book store comparison useful; it cuts through the colorful attempts by some people to portray the Internet as an invasive, irresistible deluge of information. On the contrary, it takes an act of will to connect to the Internet. And this paradigm leaves a place for responsible filtering by on-line services and parents (and

room for argument about just what "responsible" means).

Mangan and Wallace sound the alarm about the political and commercial forces who hide behind outmoded arguments to gradually roll back freedom of speech. The Net has the same chance of moving humanity forward as did the first books. Also, like the printing press, new electronic media will disseminate communications ranging from the objectionable to the subversive to the broadly acceptable.

Mark Schlack is *BYTE's* editor in chief. You can send mail to him at mschlack@bix.com.

Practical Help for the Disabled

The personal computer is a powerful tool for opening the world to people with disabilities. How to make it happen is less obvious—and the subject of this book.

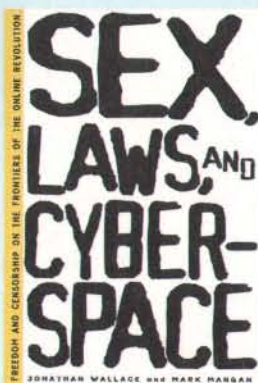
The focus and tone are relentlessly practical. Joseph J. Lazzaro (an occasional contributor to *BYTE*) is less concerned with theory than with what you can buy and use today. You'll find a surprising range of hardware and software to aid people with impaired vision, motor skills, or hearing. The descriptions that make up most of the book (and the shareware and demo programs on the accompanying CD-ROM) summarize the capabilities of each product well enough to let you make a preliminary judgment on its usefulness.

Software developers aren't forgotten. The book includes a developer's guide for writing accessible software; it's full of tips on how to design programs that don't shut out people with disabilities. As Lazzaro demonstrates, a little thought in the design phase can make the difference between software anyone can use and software that excludes people using nonstandard I/O. If you know someone who is disabled, or if you are disabled yourself, *Adapting PCs for Disabilities* is invaluable.

- Rick Cook

Sex, Laws, and Cyberspace
by Jonathan Wallace and Mark
Mangan; Henry Holt & Company;
ISBN 0-8050-4767-0;
\$24.95

Adapting PCs for Disabilities
by Joseph J. Lazzaro;
Addison-Wesley Publishing;
ISBN 0-201-48354-8;
\$39.95



Flatbed Scanner Series: Desktop Publishing Scanner

Avision's Desktop Publishing scanners generate sharper colors at faster speed. These color scanners have a range of 300 dpi to 600 dpi and support 24 bit, 30 bit to 36 bit color. With Avision's color matching technology you have "What-You-See-Is-What-You-Get" with your color photos. All Avision color scanners are compatible with PC or MAC platforms.



Document Scanner Series: High Speed Scanner (AV 800)

Avision document scanners are engineered for both document image processing and desktop publishing. The built-in automatic document feeder holds up to 50 pages and can reach the speed of 10ppm, 20ppm and 30ppm. These high speed scanners have 300 dpi resolution and support B&W, 256 level gray and 24 bit true color. Along with the industry standard TWAIN & ISIS drivers these scanners come equipped with an interface card.



IT'S VERY WELL
MADE IN TAIWAN

Portable Sheetfed Scanner Series: Personal Scanner

The AV100 series personal sheetfed scanners can scan at 300 dpi. They are equipped with a 10 page Automatic sheet feeder and scan at a fast 7 ppm. These portable scanners support B&W, 256 levels gray scale and 24 bit color. With its small 11.6"x4.2" footprint, these scanners make a perfect SOHO partner that perform multiple functions such as Fax, Email, OCR, Image Editing and Electronic Filing.



AVISION INC.

No.20, Creation Rd. 1, Science-Based Industry Park HsinChu, Taiwan, R.O.C.
TEL:(3)5782388, FAX:(3)5777017

★ South Europe: Mitas Italia,
TEL:39-471-540940, FAX:39-471-540949

★ East Europe:HUMANsoft Electronics Ltd.
TEL:361-163-2879, FAX:361-251-3673

★ Germany:bhs Binkert
TEL:49-7753-92080, FAX:49-7753-1037

★ Austria: Typhoon Asia Impex
TEL:43-1-7075566, FAX:43-1-7075553

★ U.S.A.:Avision Lab, Inc.
TEL:1-510-440-8785, FAX:1-510-440-8337

★ Brazil:SND Electronica, Ltda.
TEL:55-11-22330000, FAX:55-11-2230533

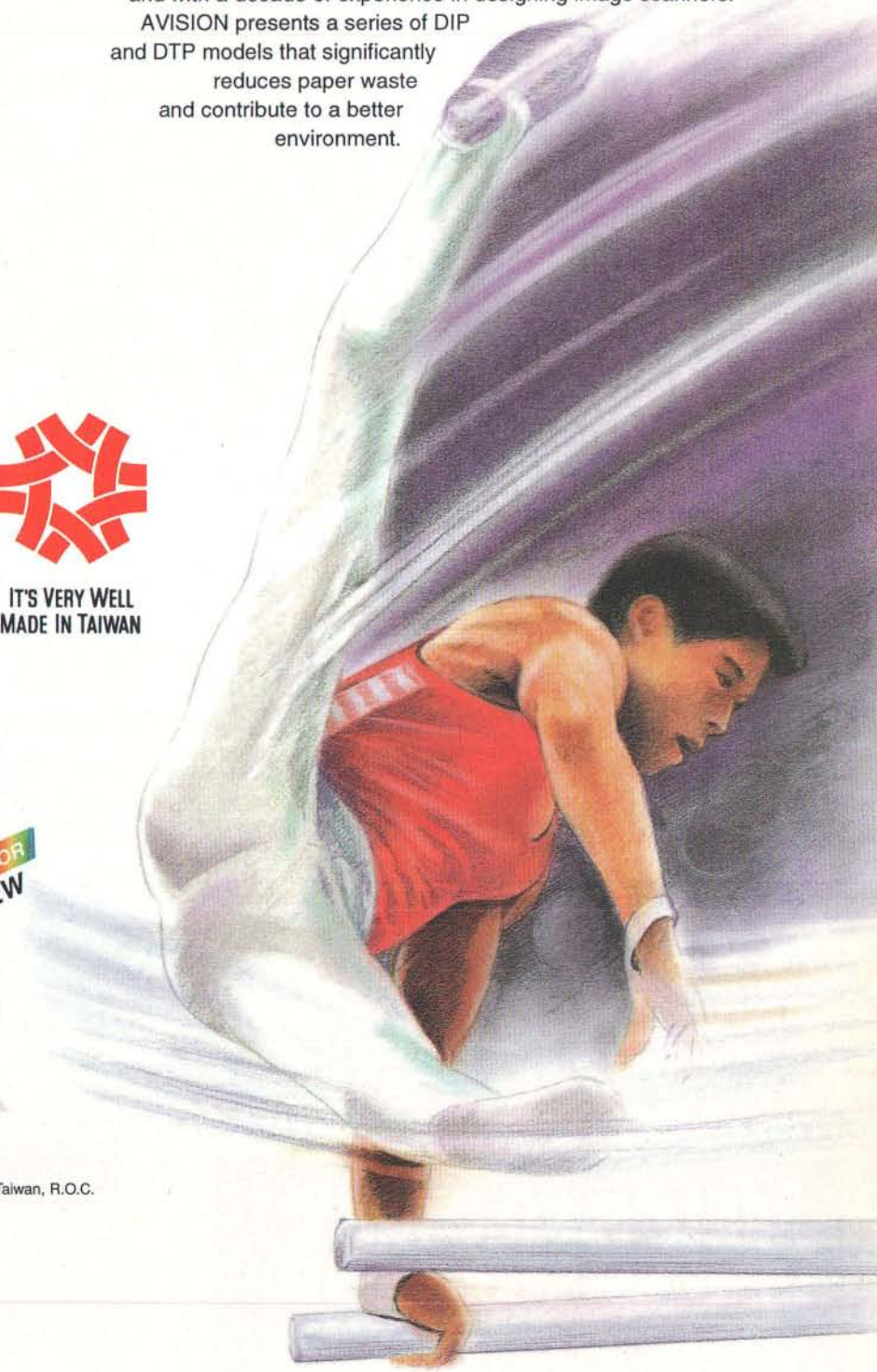
AVISION has a Vision to Make Things Better.....

"WHAT YOU SEE ON PAPER, YOU CAN SEE IN YOUR COMPUTER"

and with a decade of experience in designing image scanners.

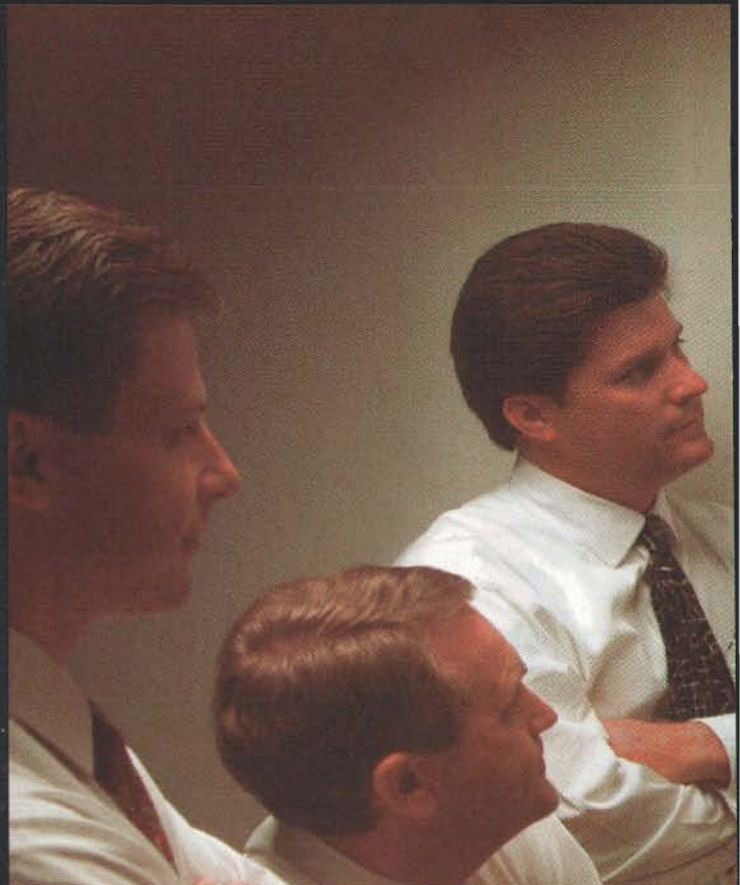
AVISION presents a series of DIP
and DTP models that significantly

reduces paper waste
and contribute to a better
environment.



Circle 741 on Inquiry Card (RESELLERS: 742).

WHEN THE JOB CALLS FOR A PRO



Now there's a desktop PC that's flexible and sensibly priced for your office or department—the **Micron ClientPro™**. Designed for long life and reliable, affordable performance, this new PC offers years of productive and adaptable computing without costly system upgrades. And now we are matching the power and reliability of the Pentium® processor with powerful system software. Introducing the new 32-bit operating system everyone is talking about—Microsoft® Windows NT® 4.0. A network operating system known for its reliability, Windows NT features the popular Windows 95 interface for the business network and integrates built-in management and support tools. Windows NT 4.0 also offers important innovations in graphics, multimedia, business productivity and the Internet, and it has excellent mixed-platform integration, a full complement of security features, multipatform and multiprocessor scalability, and reliability enhancement features. With Micron, you get a system custom configured to fit your office needs, network ready with Windows NT 4.0 and backed by our industry-leading Micron PowerSM warranty.

MICRON HAS YOU COVERED.

Micron PowerSM



Warranty & Support

- 5-year limited warranty on microprocessor and main memory
- 3-year limited parts-only system warranty
- 1-, 2- or 3-year optional on-site service agreement for Micron desktop and server systems
- 30 days of free Micron-supplied software support for Micron desktop systems; 3 free network operating system incident resolution calls for Micron server systems
- 30-day money-back policy
- 24-hour technical support

The foregoing is subject to and qualified by Micron's standard limited warranties and terms and conditions of sale. Terms and conditions of sale may vary for specific configurations. Copies of the limited warranties may be obtained on our Web site or by calling Micron.

SYSTEM CONSIDERATIONS

MICRON

Just won three PC Magazine
Editors' Choice awards

- ✓ 5-year Micron PowerSM Warranty
- ✓ 1st Tier Reliability
- ✓ Stable network performance
- ✓ Priced right

DELL

- 3-year warranty
- 2nd Tier Reliability
- High price

GATEWAY

- 3-year limited warranty
- High price

ClientPro™ P100

- Intel 100MHz Pentium® processor
- 256KB pipeline burst cache, flash BIOS
- 3Com® 3C509 Combo network adapter
- 3.5" floppy drive
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- MS-DOS® 6.22/Windows® for Workgroups 3.11
- 5-year/3-year Micron PowerSM warranty

- PCI 64-bit graphics accelerator (2MB EDO)
- 8MB EDO RAM
- 1.2GB EIDE hard drive
- 14" Micron 14FGx, .28dp (12.9" display)
- Microsoft Works preinstalled

\$1,499

Bus. lease \$51/mo.

- PCI 64-bit graphics accelerator (2MB EDO)
- 16MB EDO RAM
- 2.1GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Office Pro 4.3 preinstalled

\$2,018

Bus. lease \$69/mo.

- With 133MHz Pentium processor.....add \$100



Tollfree from Canada
800-708-1758



Tollfree from Mexico
95-800-708-1755



Tollfree from Puerto Rico
800-708-1756

International Sales
208-893-8970



International Fax
208-893-7393

900 E. Karcher Road, Nampa, ID 83687 • Mon-Fri 6am-10pm Sat 7am-5pm (MT) International Sales Hours: Mon-Fri 6am-7pm (MT)
208-893-3434 • Fax 208-893-3424 • Purchase Order Fax 208-893-8992 • Technical Support Available 24 Hours / 7 Days

Technical Support E-mail: techsupport.mei@micron.com

©1996 Micron Electronics, Inc. All rights reserved. Micron Electronics is not responsible for omissions and/or errors in typography or photography. All purchases are subject to availability. Prices and specifications may be changed without notice; prices do not include shipping and handling. 30-day money-back policy does not include return freight and original shipping/handling charges, applies only to Micron brand products and begins from date of shipment. All sales are subject to Micron Electronics' current terms and conditions of sale. Lease prices based on 36-month lease. Intel, Intel Inside and Pentium are registered trademarks of the Intel Corporation. Microsoft, Windows, the Windows logo and Windows NT are registered trademarks of Microsoft Corporation. All other service marks, trademarks and registered trademarks are property of their respective companies. BYTE-CLPR-9610

Circle 168 on Inquiry Card.

ClientPro™ P200

- Intel 200MHz Pentium processor
- 256KB pipeline burst cache, flash BIOS
- 3Com 3C509 Combo network adapter
- 32MB EDO RAM
- 3.1GB EIDE hard drive
- 3.5" floppy drive
- 8X EIDE CD-ROM drive
- PCI 64-bit graphics accelerator (2MB EDO)
- 17" Micron 17FGx, .26dp (15.8" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT® Workstation
- Microsoft Office Pro 95 & Bookshelf® 95 CDs
- 5-year/3-year Micron Power warranty

\$3,257

Bus. lease \$111/mo.

- With 166MHz Pentium processor.....subtract \$100



MICROSOFT
WINDOWS NT.
READY-TO-RUN



pentium

MICRON™
ELECTRONICS, INC.

800-486-2059

<http://www.mei.micron.com>

Web Address COMbat

While the Internet community wrestles with implementing the new version of the Internet protocol that increases the number of possible IP addresses, another struggle is taking place over the shortage of domain names. The situation stems from the fact that Network Solutions Inc.'s InterNIC controls more than 90 percent of all domain names in this country, including the top-level domains such as .com, .edu, .gov, and .net. With such a limited number of domains, the selection of good domain names appears to be shrinking.

But is there really a shortage? Rosalind Resnick, president of NetCreations (Brooklyn, NY; <http://www.netcreations.com/>), an Internet software and marketing company, doesn't think so. The problem of companies who can't get their favorite name into the domain of their Web address is analogous to trademarks, she says. "If someone already has your name [in their Web address], then you have to come up with another name. After all," Resnick points out, "in the real world, you can't start up a fast-food chain called McDonald's because that's already been trademarked."

But that doesn't stop people from wanting just one name and no other for their domain. In that sticky sort of situation, a vendor can turn to AlterNIC (<http://www.alternic.net>), which lets a company get the key words it wants in its Web address by using alternative top-level domain names. By giving enterprises more opportunities to have the name they want, AlterNIC argues, it fulfills consumers' desires and helps prevent businesses from slugging it out over who gets what domain name.

Sounds good, but there's a storm looming. InterNIC believes it is the sole gatekeeper of top-level domain names and that attempts by other companies to infringe on that responsibility interfere with its legal right to control domains. Whether AlterNIC is successful in freeing up top-level domains is an open question. But it seems certain that as more companies put marketing and sales operations on the Web, some opening up of top-level domains is certain to happen.

- SJVN

Datapro Report

Unix Survey: Users Like Reliability, Scalability, and Performance

While many users are including Microsoft operating systems in their purchasing plans, that doesn't mean they are downsizing their plans for Unix. According to Datapro's 1996 International User Ratings Survey on Unix and Open Systems, Windows NT is used in 38 percent of the organizations surveyed, and 23 percent more are planning to add NT this year. However, Unix remains popular due to its flexibility, scalability, and power, with which Microsoft currently cannot compete.

NT is the logical upgrade path for organizations that have outgrown Windows, and NT is making major inroads into Unix's low-end server market. Over the past two years, Unix vendors have reacted to market shifts caused by NT by moving to the high-end server market. For example, SCO, once considered the premier low-end Unix vendor, now markets its OS as an enterprise-class product for client/server and host-based systems.

Although users like Unix's reliability, high performance, scalability, interoperability, and client/server support, they also complained that Unix systems still cost too much, and that installation, ease of use, and user interfaces could be better. One version of Unix that received high marks for affordability is Linux, which is available for free or for a nominal CD-ROM charge. The Linux ratings cannot be considered statistically valid, but it's interesting to note that the OS scored quite well in ease of use, development tools and utilities, and of course price. It didn't score as well as the others in scalability. One reason could be that ports of Linux to RISC processors are newer to the market than versions for Intel-based PCs.

Over the years, one common complaint with Unix has been that it's too expensive. If Linux had been available 10 years ago, one can't help wonder what its impact would have been.

Mary I. Hubley, principal analyst. For more information on Datapro Information Services: (800) 328-2776; (609) 764-0100; <http://www.datapro.com>.

Product	IBM AIX	Digital Unix	HP-UX	SCO*	SunOS/Solaris	System V	Linux
Number of responses	181	81	224	202	297	114	33
Client/server support	3.5	3.6	3.7	3.4	3.9	3.5	3.4
Development tools/utilities	3.1	3.2	3.4	3.1	3.6	3.1	3.8
Interoperability/communications	3.6	3.7	3.6	3.2	3.9	3.5	3.7
Performance	3.6	3.9	3.8	3.4	3.7	3.7	3.6
Scalability	3.6	3.5	3.8	3.2	3.7	3.7	3.1
Security	3.2	3.3	3.3	3.2	3.2	3.3	2.8
User interface	3	3.2	3.4	2.7	3.2	2.8	3
Ease of installation	2.9	3.1	3.2	2.8	3.2	3	3
Ease of use	3.1	3.3	3.3	2.9	3.1	3.1	3.4
Price	2.7	3	2.9	2.8	3	2.9	4.7
Reliability	3.6	3.7	3.9	3.4	3.8	3.8	3.8
Maintenance/support	3.4	3.3	3.6	2.9	3.3	3.4	3
Overall satisfaction	3.3	3.4	3.5	3.1	3.5	3.3	3.5

Ratings are on a 5-point scale, where 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent. *(Unix, Xenix, Open Desktop, OpenServer)



600 DPI COLOR
CAPABLE on any
office paper or
transparency.

5¢ A COLOR PAGE
A fraction of the
cost of color
photocopies.

\$3,495 From the work-
group color leader with 14
years in color printing.

6 PPM COLOR
Twice as fast as
any competitor's
desktop laser.

FREE BLACK INK
Now you can send
everything to your
color printer.

Brilliant performance. Breakthrough price.

The new Phaser® 350 costs less to own, less to use than any other laser-class, workgroup color printer. With award-winning performance that's become the hallmark of Tektronix: RISC processing. Ample RAM. Networking. So now our incredible speed and brilliant color are the most affordable and economical, too. No wonder, at over \$500 million in color printing revenue, Tektronix sells more workgroup color printers than anyone.

Call 800/835-6100, Ext. 1314. <http://www.tek.com/CPad?1314>

Tektronix



Phaser 140



Phaser 240



Phaser 350



Phaser 440



Phaser 550



Phaser 480X



Phaser 300X

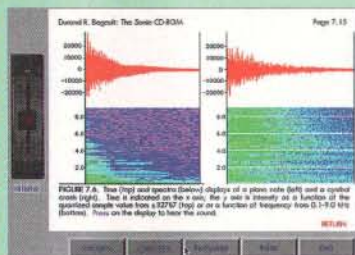
cd-rom review

Use Multimedia to Learn
Multimedia

With today's new point-and-click authoring tools, anyone can toss together a multimedia project. But mastering the text, audio, video, hyperlinks, and varied production skills often required in creating a CD-ROM, Web page, or business presentation is another matter. The Sonic CD-ROM for Desktop Audio Production focuses on one special aspect of multimedia: sound.

The disc offers a thorough lesson in audio production basics, and it makes good use of plentiful examples. This product will be most useful for technicians who want to polish their sound skills.

Another valuable CD-ROM for audio production is the IEEE's Standards in



The Sonic CD covers techniques of audio production.

Computer Generated Music. This CD offers essays and documents concerning desktop music publishing, MIDI, high-level music programming, digital audio, 3-D sound, multimedia, and computer-assisted instruction.

The amount of information varies from subject to subject. The CD may disappoint people interested in a specific angle (e.g., only one study covers 3-D sound). Overall, however, this disc delivers practical information for audio developers on a wide variety of topics.

— Jason Krause

The Sonic CD-ROM for Desktop
Audio Production
AP Professional, (800) 321 5068;
<http://www.hbuk.co.uk/app/approf.htm>
\$44.95

Standards in Computer
Generated Music
IEEE, (800) CS BOOKS;
<http://www.computer.org>
\$49.95 for IEEE Computer Society
members, \$69 for nonmembers

Web Cameras
Hit the Road

A new type of diminutive network gadget—cameras that snap images you can view with a Web browser—could start showing up in some unusual places, like highways and hallways and even your front door. Current network cameras from Microplex (800-665-7798; <http://www.microplex.com>) and Axis Communications (800-444-AXIS; <http://www.axisinc.com>) are 1-pound devices that can take color images and put them on self-contained Web servers at a rate of about 1 frame per second. Anyone with a standard browser can view those images, opening up all kinds of possibilities for remote surveillance and other types of applications that can take advantage of the Web.

The drawback with current versions of the Axis and Microplex products is they don't have serial ports; instead they use standard Ethernet UTP connections to a network. Both companies say they are planning new versions with serial ports. That would let a modem transmit the images over a standard phone line, thus providing much more flexibility in camera location. Who knows? Maybe one day commuters will rely on Web-enabled cameras placed along pop-

ular travel lanes to avoid rush-hour traffic; or maybe high-tech workers on the coast will use a network camera to see when the surf is up.

— DA

Vendors Ready
Better E-Mail
Boxes

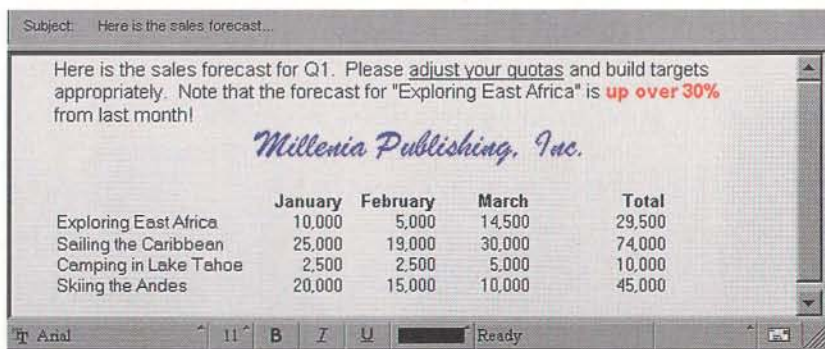
If you live in e-mail, your house may be about to undergo a major reconstruction. Lotus, Microsoft, SoftArc, and others have renovated their mail client programs to make them more tightly integrated with contact management, scheduling, and other business tasks.

Microsoft's new Outlook program, which will be part of the next version of MS Office, offers a wealth of new features (for more information, see the What's New Software Preview on page 208). And Lotus has similar developments in the works for cc:Mail (see the screen below).

cc:Mail Release 7's new capabilities include basics like the ability to apply styles to individual words in a message. More comprehensive design overhauls include a user interface that more closely resembles that of Notes Mail and tighter synchronization for remote users. The interface for creating rules for handling messages automatically has been improved, and you can test those rules before making them operational. Remote users can access files on the LAN, and new message-sorting capabilities help you tailor your mailbox interface.

SoftArc's FirstClass 4.0 (slated to ship in early 1997) will integrate new calendaring features with its e-mail, collaboration, and other capabilities. Further in the future, expect closer integration of e-mail and telephony, SoftArc officials say.

— DA



The new cc:Mail finally lets you apply styles to individual words.

There Is Only One Choice For Data Compression.

PKZIP® for Windows



**New Version
Just Released**

New Features in PKZIP for Windows Version 2.50

- ▶ Ability to create .ZIP files that span multiple diskettes
- ▶ Create a Windows self-extractor
- ▶ Self-extractor can span multiple diskettes
- ▶ Long file name support for Windows 95 (16 and 32-bit) and Windows NT (32-bit)
- ▶ Integration with Windows 95 & NT Explorer
- ▶ Plus additional features

The growth of the Internet and the increased use of World Wide Web browsers are creating a greater need to compress and uncompress data files. Saving disk space and saving on-line phone charges are big benefits of compressing data files with **PKZIP® for Windows**. PKZIP for Windows compresses files an average of 50-70% with many large text and database files compressing well over 90%. PKZIP's simple point-and-click interface lets you easily compress one file or all files on an entire hard drive, and store them in the .ZIP file. PKWARE provides the best and fastest data compression technology on the market, try it and see!

PKZIP for Windows allows you to easily open files created with PKZIP for DOS Version 2.04g. PKZIP is also compatible with Windows 3.1 or higher, Windows 95 and Windows NT.

PKZIP for Windows \$49, PKZIP for DOS \$47 plus shipping and handling.

**To order call (414) 354-8699
or visit our Web Site <http://www.pkware.com>**



The Data Compression Experts®

9025 N. Deerwood Drive / Brown Deer, WI 53223 USA
FAX: 414-354-8559 BBS: 414-354-8670
Email: info@pkware.com



1992-1996 PC World World Class Award
1996 Government Computer News
Best New Product Award at FOSE Finalist
1995 Computer Currents Readers Choice Award
1993 Shareware Industry Award
1992 Premiere Computing Magazine Award
1992 Dvorak/Zoom Award



Other PKWARE Products

Put Your Executables on a Diet



PKLITE™ increases your valuable disk space by compressing DOS and Windows 16-bit executable (.COM, .EXE and .DLL) files by an average of 45%. The operation of PKLITE is transparent, all you will notice is more available disk space! Price \$46

Software developers, save disk space and media costs with smaller executables. You can distribute your software in a compressed form with PKLITE Professional™. PKLITE Professional gives you an extra option to compress files so that they cannot be expanded by PKLITE. This discourages reverse engineering of your programs. Price \$146

Put Compression Into YOUR Application

The PKWARE Data Compression Library® products allow you to incorporate data compression technology into your software applications. The application program controls all the input and output of data, allowing data to be compressed to or extracted from any device or area of memory.



The all-purpose Data Compression Algorithm compresses ASCII or binary data quickly. The routines can be used with most compatible language compilers. Separate DOS, DOS32, Windows, OS/2, Win32, UNIX and Macintosh versions are available! Call for pricing.

BY-1096

Copyright 1996 PKWARE, Inc. All Rights Reserved. All trademarks or registered trademarks are property of their respective owners.

Circle 151 on Inquiry Card.

check
out *it*!

www.
data.
Com

Check out the new web site
from Data Communications

www.data.com

Blasts from the Past

5
Years ago in BYTE

Desqview/X from Quarterdeck finally brought the X Window System to DOS, to tepid response from the market. Microsoft admitted that NT wouldn't support OS/2. Bill Gates said sales of special Presentation Manager versions of Excel and Word were dismal. Meanwhile, Lotus released the first version of 1-2-3 for Windows and the Mac. Lotus later turned its back on the Mac version. And rifts started appearing in the Advanced Computing Environment when it turned out you really would need at least two versions of source code and four compilers. Meanwhile, Compaq's new systems promised Plug and Play, but not *The* Plug and Play. Compaq's version mostly promised that you'd be able to upgrade the processor.

10
Years ago in BYTE

The Apple II GS received mixed reviews. We liked its new 16-bit processor but worried that the GS cost too much and didn't offer graphics superior to the Amiga or Atari. Also, we wondered why Apple would invest such energy in preserving 10-year-old technology.

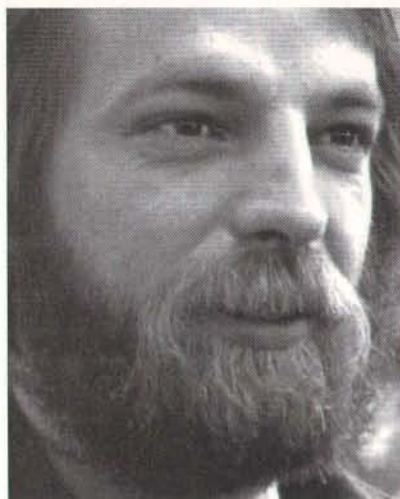
15
Years ago in BYTE

In their first good look at the brand new IBM PC, BYTE's editors were impressed and even surprised that Big Blue, known then for its big iron, could do such a swell job on a PC. We also ran a long tutorial on an up-and-coming new technology for PCs known as the local-area network.



A Dark Cloud of Bugs

Bruce Brown, president of BugNet, discusses beta software, the proliferation of bugs, and their threat to the industry.



BYTE: *How did you decide to get into the bug-reporting business?*

Brown: About two years ago, I had a sense that compatibility, glitches, and bugs were going to become an increasing concern to PC users. It seemed clear to me that the bowl of jelly was going to shake when Windows 95 and Windows NT 4.0 hit. I felt this was going to create a need for products and services that would help users get over, or around, these problems. At the outset, we were doing a traditional newsletter, but the newsletter is now 100 percent electronic on the Web. We also sell a database of bug/fixes in HTML, and are syndicated in a half dozen major dailies, as well as InfoWorld and Computer Currents. We also just signed an exciting new mass marketing deal with Online Interactive.

BYTE: *With all the free beta software available today, do you feel that people are more willing to put up with bugs?*

Brown: That's a complex question which has to be addressed from a couple of angles. Because of the need to generate revenue and sustain stock prices, there is a lot of pressure to release product as quickly as possible and to deal with bugs later. This is a fact of the business and, if anything, is becoming more prevalent, even though vendors obviously don't want to put out products which are so buggy that they depress sales. Beta is a little different, but it also plays into the

software vendors' almost maniacal desire to curtail support costs. Beta looks like a dream come true to the vendors because they can say up front, "We're not going to support this," and at the same time they derive certain testing benefits from people who use a beta product and inform the company of problems.

BYTE: *Why then is beta a threat?*

Brown: The threat is that installing beta can screw something else up in your system. For example, in a bug that BugNet broke, it was revealed that Internet Explorer 3.0 Beta 2 running under Windows 95 replaces one or more system files with versions that are incompatible with some commercial products that you pay money for. So you install the beta and, all of a sudden, some commercial products don't work as they should. And you go to the vendor you paid money to, and now the vendor may very well say to you, "This is a beta, and we don't support beta. You're on your own." Users don't realize that the "free" program that they download may in fact cost them a lot of time and money.

BYTE: *Do you think this will change?*

Brown: This gets into an issue that I think is really societal. We have come into a situation where the expectations of the user are changing. There is a conflict between the expectations of the traditional users of PCs, the PC enthusiasts, and the new group, normal people who may not want to spend their weekend screwing around with their printer drivers. To make the PC an everyday appliance, this large new group must be satisfied. But these folks expect the darn thing to work when they turn it on, and of course the PC fails this basic test far too often. And so even though the industry as a whole may be doing a better job in the minds of traditional users, it may be doing worse in the minds of the users that the vendors most want to reach. And this, in turn, may be part of why such a shockingly small percentage of PC sales are made to first-time purchasers.

For more information, see
<http://www.bugnet.com/~bugnet>

INTERNATIONAL



*Integrating faxes with company messaging systems. Page 48***IS 3**

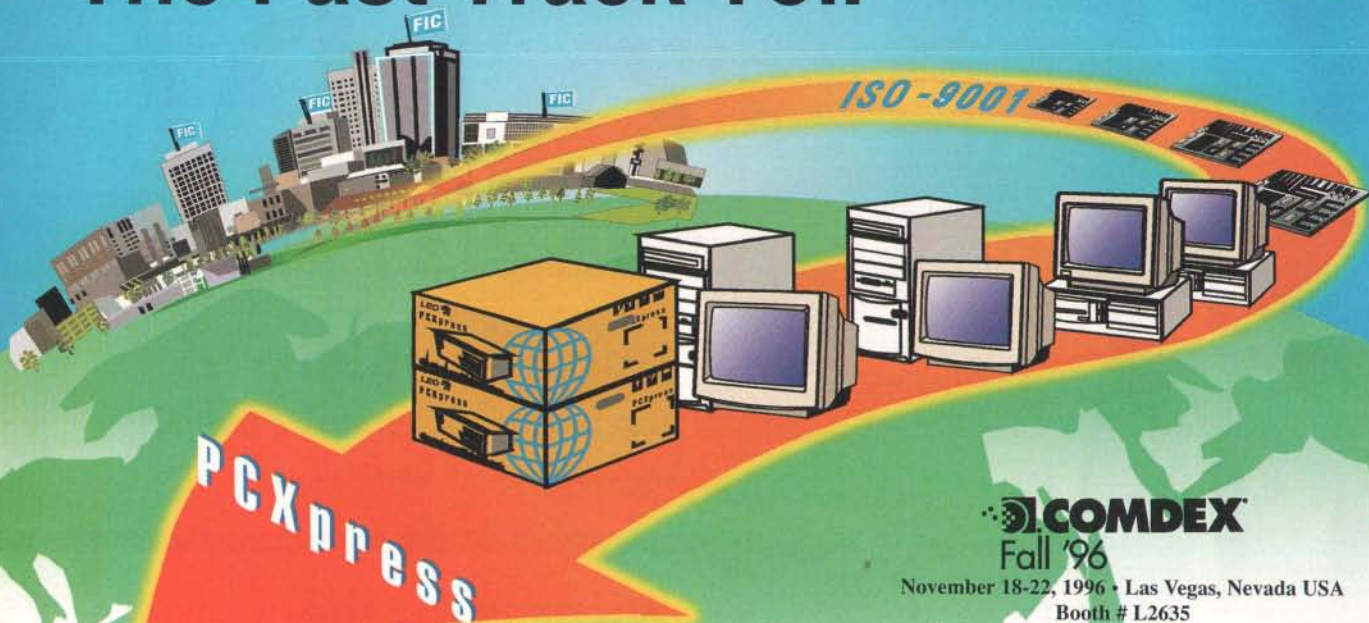
Forensic computing comes of age.
Page 48 IS 3

*Machine translation is improving,
but the technology still stutters.*
Page 48IS 7

By knowing how Internet traffic flows, you can more wisely pick the best provider. Page 48 **IS 13**

Asian companies are building a new generation of control boxes.
Page 48 IS 19

The Fast Track To..



Increasing Your PC Systems Business

Deliver the hottest new systems to your markets with PCXpress, a complete range of high-quality, leading-edge systems designed and built to your requirements by FIC, the world's leading motherboard manufacturer.

Convenient System Upgrades

For maximum flexibility, PCXpress systems run all the latest processors from Intel, AMD & Cyrix. Pipeline Burst SRAM plus EDO and Burst EDO DRAM support adds further versatility and performance.



Wide Selection of High-Quality Peripherals

With our global buying power, FIC brings you the best possible pricing for a complete range of peripherals and multimedia add-ons - allowing you to easily differentiate your systems in the market.



Cutting-Edge R&D Capabilities

With our state-of-the-art R&D facilities, FIC is a world leader in the development of cutting-edge motherboards and PCs - giving you the products you need to succeed in even the most competitive markets.



Efficient, High-Volume Manufacturing Facilities

Mainboard manufacturing and barebone system assembly are carried out in FIC's efficient, high-volume ISO 9001-certified facilities in Taiwan and China using advanced SMT and AI machinery.



Localized Build-to-Order Services

With their sophisticated distribution system and efficient assembly operations, FIC's facilities in the USA, Europe, Australia, and Hong Kong ensure your systems arrive on-time to market.



The Highest Quality At the Best Prices

FIC's sophisticated vertical integration program and our high-volume purchasing power guarantee you the lowest possible prices for high-quality system components. Close ties with the world's leading component suppliers ensure guaranteed deliveries even in times of shortage.



Circle 737 on Inquiry Card
(RESELLERS: 738).



6F, FORMOSA PLASTICS REAR BUILDING
201, TUNG HWA NORTH ROAD,
TAIPEI, TAIWAN
Tel: 886-2-7174500 Fax: 886-2-7182782
<http://www.fic.com.tw/>



First International Computer, Inc.

FIC US
FIC EUROPE B.V.
FIC AUSTRALIA
FIC CZECH REPUBLIC

Tel: 1-510-2527777
Tel: 31-73-6273300
Tel: 61-2-7484566
Tel: 42-5-41122643

Fax: 1-510-2528888
Fax: 31-73-6231412
Fax: 61-2-7484633
Fax: 42-5-41213144

FIC FRANCE
FIC SPAIN
FIC HK
FIC JAPAN

Tel: 33-1-46810203
Tel: 34-1-6373613
Tel: 852-2-3453599
Tel: 81-3-5461-2181

Fax: 33-1-45739885
Fax: 34-1-6373863
Fax: 852-2-7972408
Fax: 81-3-5461-2344

Specification subject to change without notice. All trademarks used herein are the registered property of their respective owners.

Your Complete Inbox

The latest versions of fax software integrate with corporate messaging systems.

A new round of fax-server software, from several European vendors, features inbound routing via ISDN, scheduling, least-cost routing, and advanced cost management. The programs can also integrate with standard messaging systems or provide a comprehensive communications platform by themselves.

Products include Equisys's (London) Zetafax, Fenestrae's (Leidschendam, The Netherlands) Faxination, and Digitronic's (Hamburg, Germany) Faxit. The latest versions of all these programs are tightly integrated with Microsoft Exchange. Thus, a user of any of these systems can send and receive faxes by using his or her familiar e-mail client and address list. A key feature of these systems is drag-and-drop

support of attachments. With Faxination, for example, you can attach Word, Excel, and RTF files, while Faxit supports a list of 40 file formats as attachments.

However, "a fax gateway for Exchange is only the first step," says Wim de Koning, the president and CEO of Fenestrae. "We're also currently working on a consistent gateway architecture for Electronic

Data Interchange [EDI], X.400, GSM Short Message Service [SMS], and Telex." Koning says that the company's Interpersonal Messaging Server will extend the Faxination kernel and also include end-to-end

addressing; access security, such as logging, tracking, and support for firewalls; and connectivity to major business applications, such as SAP's R/3.

Tobit (Ahaus, Germany) is taking an

SUBJECT	DATUM	ZEIT	SENDE
SPRACHE	20.06.96	14:23:51	+
FAX	20.06.96	10:50:46	+Publi
SPRACHE	20.06.96	10:48:24	+
SPRACHE	20.06.96	09:39:26	+
sprachtest	20.06.96	09:05:15	Michae
sprachtest	20.06.96	08:56:09	Michae

Tobit's fax-server technology is turning into a universal message inbox.

Fax or E-Mail?

Four-fifths of the U.K. businesses polled would rather give up their e-mail than their fax systems. The reason: the ubiquity of fax machines. Only 42 percent of the small companies surveyed use e-mail, while 79 percent of large ones do, says market-research firm International Data Corp. (IDC).

other approach: turning its NetWare-based fax server, FaxWare, into a universal communications platform. Code-named David, the system has a central multimedia archive for incoming faxes, e-mail, and other documents that can be accessed via LAN, fax, phone, or Web. This concept lets a company's employees access all kinds of personal documents with a variety of media from anywhere in the world. Tobit also plans to support paging services, SMS, and text-to-speech output. Says Dieter van Acken, marketing manager at Tobit: "Universal inboxes like David will soon be the core of many virtual offices."

—Rainer Mauth

Witness for the Prosecution

Computers are serious business tools, but sometimes they also support business delinquency. So, how do you go about questioning a computer? Authentec, a U.K. data-recovery company, now has an answer: Do it at the sector level of the BIOS, and don't change a single bit.

Authentec has developed a portable file server that allows investigating authorities to make a replica, or image, of a target computer system at the site of an alleged crime. Called FlightServer, the system runs NetWare 3.12 and copies a hard disk, sector by sector, without interfering with the target system.

Once this image has been taken, it can then be investigated at the prosecutor's office using Authentec's forensic software package, which indexes all a hard disk's sectors, including lost chains, and automatically sets up libraries of words relevant to the case.

The company says that the biggest problem for prosecutors of computer crime is not the technical reliability of the FlightServer system but the computer ignorance of most judges. Despite today's sophisticated digital image-manipulation techniques, judges still trust a photo more than a sector-by-sector image of a hard disk.



Inspector FlightServer at work.

Demand Soars for Big Screens

Asian firms predict a huge demand for wall-mounted plasma displays.

The demand for large-screen color plasma display panels (PDPs) is now heating up in Asia. Japan's Fujitsu, NEC, Sharp, and others are introducing large-screen



Fujitsu's new 42-inch-wide color-plasma display.

PDPs, while Korea's Samsung is reportedly making large investments in the arena.

NEC is building a new PDP factory in Kagoshima, with production slated to begin in April 1998. Production quantities are expected to reach 30,000 units per month, NEC says. The company has already completed the development of 33- and 42-inch PDPs and has plans to ship these products in August and December, respectively.

PDPs are one of the key display types for next-generation multimedia applications, such as wall-mounted TV screens. PDP technology has been around for a while, but recent advances in the technology have made the products more cost-effective to produce, NEC officials say. The company estimates that the PDP market will grow from 3 million units, or \$2.4 billion, in the year 2000 to 11 million units, or about \$7 billion, by 2002.

—Mark LaPedus

Korea to Install New CDMA Phone System

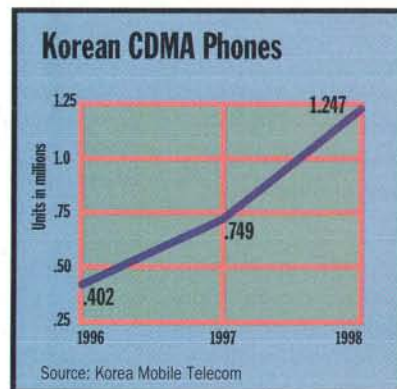
During the next two years, Korea will deploy its initial Personal Communication Services (PCS), a wireless cellular system that provides greater capacities than traditional analog phones. But Korea is

not going with the de facto standard in digital cellular—Global System for Mobile Communications, or GSM. Instead, the country will deploy the code division multiple access (CDMA) system, a technology that operates at a frequency of 1.9 GHz. (GSM operates at 900 MHz.)

CDMA modulates the signal from each user by using a digital code that spreads the spectrum across a wide bandwidth. CDMA proponents, such as Qualcomm (San Diego, CA), claim the technology offers better voice quality and less multipath resistance than competitive digital cellular systems.

In Korea, Shinsegi Telecom last spring began providing PCS services based on CDMA technology in Seoul and Taejeon, joining Korea Mobile Telecom in the business. Meanwhile, the Korean government recently issued similar licenses to LG Telecom, Hansol Paper, and the state-run Korea Telecom.

As Korea moves from analog to digital cellular services, the demand for CDMA-based phones in the country will jump from 402,000 units in 1996 to 1.247 mil-



Demand for CDMA-based hand-held phones in Korea, in total units.

lion in 1998, according to figures from Korea Mobile Telecom. Meanwhile, in the U.S., the demand for CDMA-based telephones is expected to increase from 400,000 units to 2.245 million, according to market-research firm BIS.

To support CDMA-based technology, Korea will deploy land-based base-station transceivers. Samsung recently began mass production of CDMA-based hand-held phones in Korea. Samsung, which will reach an annual production of 1.5 million units by 1997, will sell its CDMA phones in the local market, in the U.S., and in other nations that are backing the technology.

—Mark LaPedus

Psion Clones Coming

Pegasus-based PDAs are also on the horizon.

Psion, the U.K.-based computer company that holds a third of the world market for palmtop devices, is currently licensing its ROM-based OS and applications to other manufacturers. Psion hopes that the move will grow the market and foster the development of new smart phones, mobile Web browsers, and intelligent terminals that will capitalize on the convergence of computer and telecommunications technologies.

The first licensees and products based on Psion's EPOC platform will be announced next year. Company officials say that there will be no reference design, like the one discussed for the Web PC, because the target systems can differ so widely (e.g., a feature phone versus a complete PDA).

Psion's decision to license its OS may be partially motivated by the slew of new PDAs expected to be released later this year. These new systems will be built around Pegasus, a new Windows-compatible OS for PDAs from Microsoft. But Stephen Randall, Psion's vice president of licensing, says Pegasus-based products are not a threat because "through our licensing, the Psion platform will move into many highly customized solutions." He adds that the desktop companion products that Pegasus is intended for are not the target market of Psion licensees.

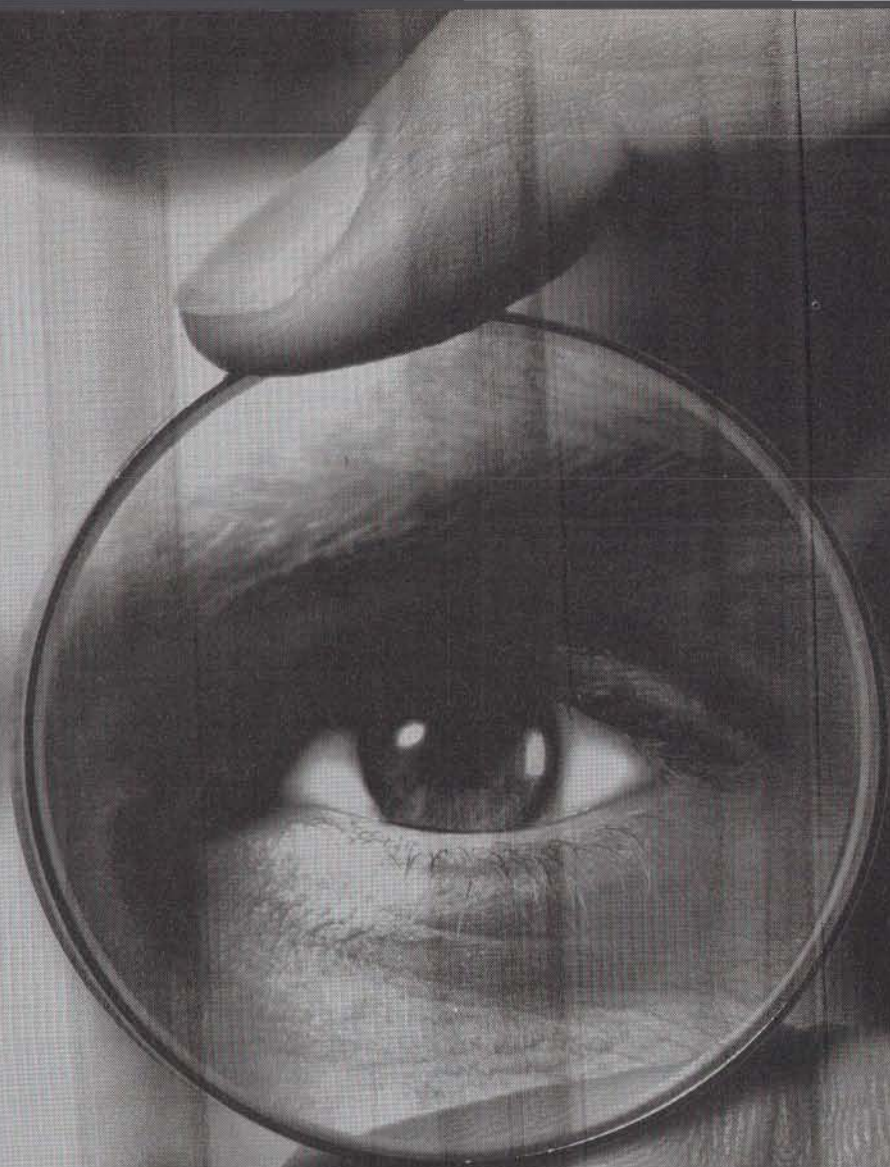
The first new Psion model to be made available to palmtop manufacturers will succeed the popular Psion 3a series. It will be constructed around the highly integrated ARM7100 processor (fabricated by Cirrus Logic [Fremont, CA]), which is basically a complete PDA on a chip. Other systems will also deploy the powerful StrongARM chip, which has the ability to bring speech recognition to the next generation of Psion computers.

—Jim Nagel



Psion's popular 3a model.

MESSE MÜNCHEN
INTERNATIONAL



MEET EUROPE AND COMMUNICATE

SYSTEMS 96

15th International Trade Fair and Congress for Information
Technology and Telecommunications

Circle 723 on Inquiry Card

Munich, 21 – 25, October 1996

Telephone: +49-89-51 07-284/285 · Fax: +49-89-51 07-175 · Internet: <http://www.systems.de>

DROWNING IN C/S DEVELOPMENT DEADLINES?

We're worth the ring.

WEB ENABLED
C/S APPS

SCALABILITY

TABLE-DRIVEN
RAD

PORTABILITY

APPLICATION
PARTITIONING

N-TIER
ARCHITECTURE

APPLICATION DEVELOPMENT EMERGENCY!

Before you get dragged down by mounting development deadlines and budget overruns, call the "911" of application development tools: Magic. Magic delivers mission-critical client/server applications faster than any other tool on the market. It's been proven by consecutive victories at all of the world's top development competitions. And it's being used by companies like Rolls Royce, Matsushita, Gannett and Club Med. New Magic 7 adds Windows 95 and NT to Magic's wide range of supported platforms and databases. So download the Test Drive from the Magic Web site or give us a ring. Your client/server development projects could certainly use the lift.

Circle 709 on Inquiry Card (RESELLERS: 710).

Magic Software Enterprises

1642 Kaiser Ave.

Irvine, CA 92614

Tel: (800) 345-6244, (714) 250-1718

Fax: (714) 250-7404

MAGIC

<http://www.magic-sw.com>

You Said What?

Machine translation tools are far from perfect, but they can save you serious money.

By Peter Haapaniemi and Peter Hofland

Think globally, act locally. That's a mantra international organizations chant constantly. But at a price. In large corporations, the total costs of translating things such as marketing materials and documentation can add up to several million dollars a year. IBM, for example, spent more than \$100 million last year to translate manuals from English into 25 other languages.

The problem is especially acute for European corporations, which generally provide documents in at least three or four of the European Union's nine official languages. What these companies are looking for are sophisticated, multilingual translation tools that can help reduce these costs.

Machine translation (MT), the use of computers to automate translation, is one of the computer industry's oldest areas of interest—and one of its most frustrating. Computer scientists and linguists have been working on MT techniques for decades. The results are disappointing: Perfect translation without human intervention is still a dream that will not be realized for the next 10 years or so.

MT has come a long way from simple word-to-word translation. Products can now deduce subtle contextual differences in languages. But even the most sophisticated systems on the market are far from automatic. They are, however, useful support tools for professional human translators. Some systems are based on huge dictionaries that translators use to more efficiently look up words and phrases. Other systems take a first look at a document and produce a rough draft that is then edited by a human translator. The best of these tools can deliver about 80 percent accuracy, experts reckon.

Real MT breakthroughs are rare and developments are slow because of the complexity and continuous progression of lan-

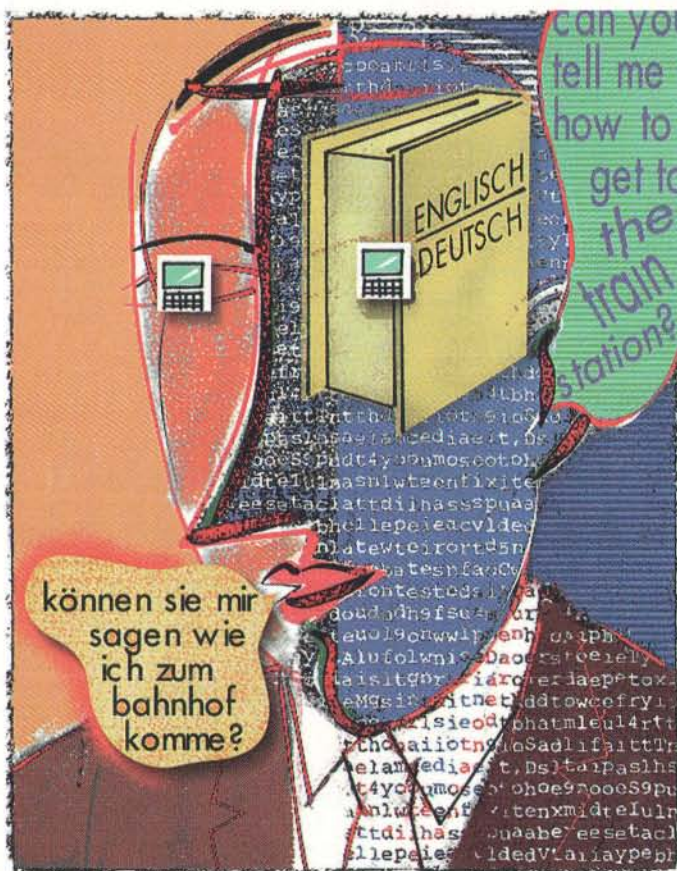
guage. To be truly effective, a translation system must take into account the formation and use of words, syntax, and semantics. Furthermore, it must be able to recognize colloquial phrases, acronyms, and contractions—not to mention incorrect grammar and misspelled words. That's why many vendors of language processing tools are now changing strategy. Rather than trying to keep up with constant additions to their products, they are making them customizable, enabling users to update dictionaries and also extend context sensitivity.

Globalink's new generation of technology, dubbed Barcelona, allows translators—rather than programmers—to include their own rules of how words should translate in a certain context. That means the front-line translator can efficiently deal with new word fields and idioms that might occur in a specific project. Globalink says this new technology will soon incorporate a "wizard" that allows nonexperts to implement rules in a comprehensive high-level language. Other Windows programs will be able to access the Barcelona translation service via OLE Automation or an API.

Another example of a tool that lets users fine-tune the translation process with an expandable context-sensitive dictionary is Logos' Samantha. According to

Mark Andrews, a Logos product marketing manager, this new generation of customizable translation tools enables users who systematically track new phrases and idioms to get to a point where they can push a button and generate close-enough translations for internal company documents and other communications.

So how do you keep up with ever-changing contexts and the variety of technical terms that occur in new projects? One answer comes from the Rank Xerox Research Center (RXRC) in Grenoble, France. RXRC's Terminology Extraction Project aims at facil-



itating the building of dictionaries. It compares translated documents in both the original and the target language and aligns the text sentence by sentence. Then it extracts the multiword expressions and produces a list of paired terms that can be incorporated in a dictionary. In other words, the system automatically detects multiword expressions in the original and the translated documents and puts them in a dictionary. The technology currently works in Dutch, English, German, French, Italian, Spanish, and Portuguese.

A dictionary of 20,000 terms can take

1000 hours to build and cost up to \$600,000, RXRC researchers say. With well-bred extraction tools, such costs can to a large extent be eliminated, they say.

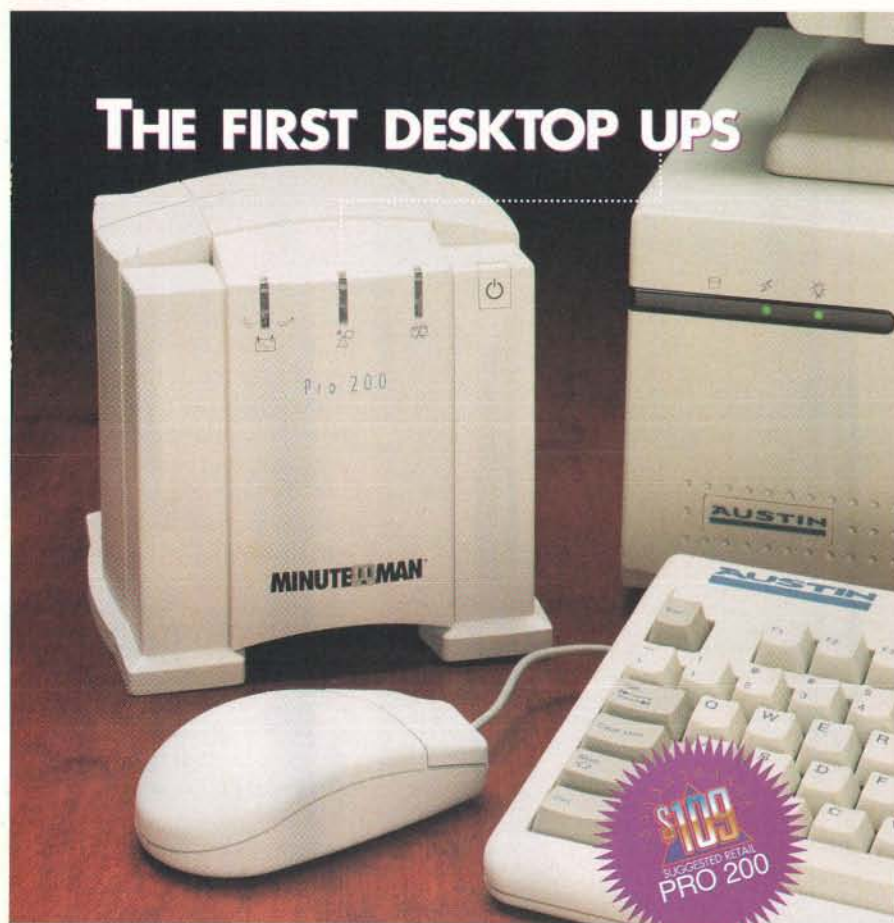
The Terminology Extraction Project is part of the Xerox Lexical Development Architecture (XeLDA). This translation framework includes tools that can detect phrases. For example, if you click on the word "sweep" in the phrase "to sweep it under the rug," you don't get the translation of "to sweep,"; you get the translation of the complete phrase. This happens even if the idiom is split up, as in "to

sweep that crime under the nearest rug," because the system is designed to detect basic idioms.

Although the XeLDA services are prototypes, RXRC is planning to make these kinds of services commercially available in corporate LAN environments or over the Internet. "In the long term," says Monica Beltrametti, director of the Grenoble RXRC, "we aim to provide our Translation Aid Network Services as general-purpose translation tools to any networked computer user faced with multiple languages at work."

Personal MT

The market for MT tools has traditionally been professional translators in large corporations, international organizations, or governments. However, a new,



Finally, there's a UPS that belongs on TOP of your desk and not by your feet.

MINUTEMAN's new Pro Series packs a host of new features and unprecedented power protection in a tiny, ergonomic package, plus an unmatched three year warranty.

Good looks may go a long way for some desktop products, but the Pro Series has so much more to offer PCs, servers, networks, and even telecommunications equipment:

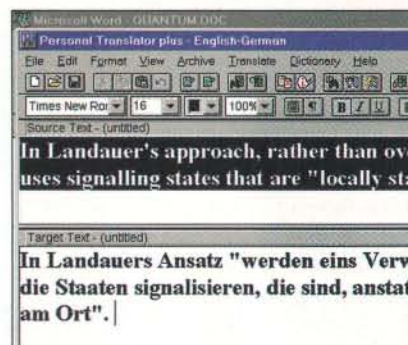
- Full protection from spikes and surges
- Battery backup during blackouts
- FAX/modem/data line protection
- Available with power management software (280 VA and above)
- Hot-swappable batteries
- Automatic battery management
- Intelligent microprocessor
- SNMP-ready (280 VA and above)
- Models range from 200 VA to 1400 VA

Minuteman is the first company to offer you a smart UPS with automatic voltage regulation for only \$109.

Call us to find out more about MINUTEMAN's New Pro Series, and see why we say it's the first UPS to reach the desktop.

MINUTEMAN
UNINTERRUPTIBLE POWER SUPPLIES
800-238-7272
www.minuteman-ups.com

MINUTEMAN UPS • 1455 LeMay Drive • Carrollton, TX 75007 •
Phone: (214) 446-7363 • Fax: (214) 446-9011 • 24 Hour Info by Fax (800) 263-3933



Detecting subtle contextual differences requires fine-tuning of dictionaries and syntactical analysis.

more casual market for translation tools is emerging. Much of the information being passed around the globe doesn't require the precise translation that a novel or a technical manual might. "There is an increasing need for quick multilingual information scanning," says Ann-Marie Derouault, IBM's worldwide speech and translation marketing executive. "No one would pay a professional translator to translate an e-mail message because a quick translation that gives you a rough idea of its content is all that's required."

New products in this area are nevertheless context-aware, and some also use sophisticated syntactical analysis. They integrate with standard word processors and are priced at less than DM 500. Here are some examples:

- IBM Europe now offers Windows and OS/2 versions of its host-based translation technology, Personal Translator. This program comes in a basic package

Direct Speech-to-Speech Translation

Direct speech-to-speech translation aims to provide translation in real time for applications such as videoconferencing or automatic translation over the telephone. Although this seems like the next step in machine translation, the technology is still not mature enough for commercial products. But researchers persist. Organizations working in this field include the C-Star Consortium and the Interactive Systems Laboratory (ISL), a cooperative venture of the University of Karlsruhe in Germany and Carnegie Mellon University in the U.S.

C-Star includes companies and academic institutions from France, Germany, Italy, Japan, India, Korea, the U.K., and the U.S. In 1993, C-Star demonstrated automatic inter-

pretation over the phone in a series of bilingual experiments. That system required the speaker to talk very clearly and be grammatically correct, which humans normally don't do. C-Star II research aims to reduce such restrictions and create more robust interpreting systems that can recognize ordinary spontaneous speech, translate it, and turn it into synthesized speech. C-Star's goal is "multilingual speech-to-speech translation" in real applications by 1999.

The ISL's Janus speech-to-speech project deals with learning and handling new vocabularies in predefined situations, such as scheduling of appointments. It supports English, German, Spanish, Japanese, and Korean. The collaboration has developed a

laptop-based speech translator that handles spontaneous, continuous, speaker-independent translation in limited domains. Translation output can be presented as synthesized speech or as text on screen or transparent goggles.

ISL has also developed a translating video-phone station that allows one person to hear another's original voice and receive translations as subtitles or synthesized speech. When the speaker on one end makes a statement, the system returns a paraphrased version for verification. As soon as the speaker has verified it, the system translates the message and sends it to the recipient. Although the translation is not instantaneous, it allows for adequate straightforward communication.

with a vocabulary of 160,000 words and 440,000 phrases and in an advanced version with approximately 200,000 words and 550,000 phrases. In Italy this technology is used in Synthema's PeTra Eng-

lish/Italian translation product, which runs under OS/2. And in Germany, IBM has worked with v.Rheinbaben & Busch Electronic Publishing to create a Windows-based German/English version of

the Personal Translator technology.

- Accent Software offers Accent Duo with Translation, which integrates translation with word processing capabilities. This Windows system is available in

E U T R O N . C O M P U T E R S E C U R I T Y

Smartkey plus

PROTECTING SOFTWARE THE SAFE WAY



SMARTKEY PLUS is the professional protection system against illicit duplication of software.

The intelligent hardware key is plugged into the PC's parallel port: protected programs cannot be run without it.

Using programmable security codes, SMARTKEY PLUS protects software running under DOS, WINDOWS, WINDOWS95, WINDOWS/NT, OS/2, UNIX, AIX, LINUX.

SMARTKEY PLUS comes in different models to protect any type of environment, from PC to LAN, whatever the application, from the simplest to the most sophisticated and demanding.

- ▶ Unique personal code
- ▶ Memory up to 448 bytes
- ▶ Programmable algorithms
- ▶ Protection through linkable drivers or automatic .EXE files protection technology
- ▶ LAN license control
- ▶ High security ASIC technology
- ▶ Fully transparent to parallel port use for printers, pocket network adapters, SCSI adapters, etc.
- ▶ Daisy-chainable
- ▶ In compliance with EU 89/336 standard (EMC)



Eutron

EUTRON 24048 Treviolo Bergamo Italy - Via Gandhi, 12 Tel. +39-35-201003 Fax +39-35-201277 - e-mail eutron@mbox.vol.it

■ Belgium: Akkermans 03-2338826 ■ Bulgaria: Vilmat 02-764533 ■ Finland: Dalma 90-2711800 ■ France: Logidata 1-46454546
 ■ Greece: Inter Engineering 041-531363 ■ Hungary: Montana-Kriptologia 1-2691191 ■ Poland: Gem Computers 022-261576
 ■ Slovenia: Stubelj 065-63215 ■ Sweden: JM Data 042-238444 ■ Spain: Larcu 91-7952413 ■ The Netherlands: Akkermans 046-4432424

English to Spanish, German, French, or Italian versions (it works bidirectionally). The program features a spelling checker and a thesaurus in both languages and lets users translate documents automatically or work interactively.

• Logos' Remote Client is a Windows application that lets users dial into a Unix-based translation server. You can choose a multitude of dictionaries for several subjects, then send the job to the server, which returns a translated version. Users can maintain their own translation server or call the Logos corporate server, which costs

\$.04 per translated word. Logos' goal is to make machine translation available to smaller businesses and freelance translators who can't afford a high-end system.

Another force driving translation technology is on-line chat and communication in newsgroups. CompuServe, for example, offers English/French and English/German translation in some of its help forums. These translations are often very meager, but their value is immediacy, because in the context of a support forum messages can lose their relevance if they are delayed. As a CompuServe

manager puts it, "The purpose is to quickly provide translations that otherwise would take hours to understand."

Multilingual translation is also reaching the World Wide Web. Globalink, for example, provides an add-on to Netscape Navigator 2.0 that translates Web sites in Spanish, French, or German into English, and vice versa, at the click of a button. Called Web Translator, the software allows users to translate on-line, or to save pages to be translated off-line, while maintaining the original page's hot links, graphics, and formatting.

The development of multilingual translation tools is key for most companies. Many of these systems support at least three of the main European languages—English, French, German, and Spanish. However, there is no such thing as a one-size-fits-many translation tech-

T-288ND + TRS32 for ISP solution

- Intelligent TRS32 Chassis with Dual Port V.34 Modem card (T-288ND)
- High Density-Max.32 ports per shelf
- Comply ITU-T V.34, V.32bis, V.32, V.22bis
- Hot swapping
- Dual Redundant Power Supply
- LCD menu driven operation
- Specially designed for Internet ISP Applications



DT-128 for DDN & PACNET solutions

- High Speed Network Termination Unit Use 2B1Q line coding and echo cancellation technique
- Synchronous 1200bps to 64/128Kbps or Asynchronous 300bps to 38.4Kbps transmission rate
- Operating coverage up to 5.5/7.4Km over a 26/24 gauge wire respectively
- LCD Menu driven operation



Integrated with TAINET MANAGER - Windows based NMS/SNMP features



TAINET COMMUNICATION SYSTEMS
3FL, NO.6, ALLEY 23, LANE 91, SEC. 1, NEI HU RD.,
TAIPEI, TAIWAN, R.O.C.

TEL: 886-2-6583000 FAX: 886-2-6583232

E-mail: #sales@accmail.tainet.com.tw

URL: http://www.tainet.com.tw



The Professional Partner

WHERE TO FIND

Accent

Jerusalem, Israel
+972 2 793 723 243
fax: +972 2 793 731
normank@accent.co.il
http://www.accentsoft.com

Logos

Eschborn/Ts., Germany
+49-61 96-59 03 0
fax: +49-61 96-59 03 15
http://www.logos-ca.com

Globalink Europe

Bracknell,
Berkshire, U.K.
+44 1344 382111
fax: +44 1344 382112
http://www.globalink.com

Rank Xerox Research

Centre Grenoble
Meylan, France
+33 76 61 50 76
fax: +31 76 61 50 99

IBM Europe

Paris, France
+33 16 38 55 77 77
ibmrep@fr.ibm.com

v.Rheinbaben & Busch Electronic Publishing

Munich, Germany
+49 89 7237777
fax: +49 89 723 87 58

nology. The experience of developing a translation system that works from language A to language B is in most cases of little help when developing a system for languages C and D. Merely replacing dictionaries is not enough because it does not reflect the grammatical structure or different semantic classes of words.

This famous example illustrates the difficulties of MT. Use any standard translation system to translate the old saying "The spirit is willing but the flesh is weak" to French and then back to English and you will get something like "The alcohol is strong but the meat is weak." **B**

Peter Haapaniemi and Peter Hofland are technology journalists at The Visual Consultancy Corp. in Amsterdam. You can contact them at 100544.307@compuserve.com.

... Windows 95 ... Dos ... Windows ... Windows NT ... Windows 95 ... Dos ... Windows ... Window NT ...

Windows for WorkGroups ... Windows NT Server ... Novell ... Windows for WorkGroups ... Windows NT Server ... Novell ... Windows for WorkGroups ... Novell

Modem Sharing & Fax Server Software for Networks

powerful secure affordable



WINport/FAXport

a complete data communications
& fax server

LANSource Deutschland
Tel: 5206 9124 24
info@lansource.de

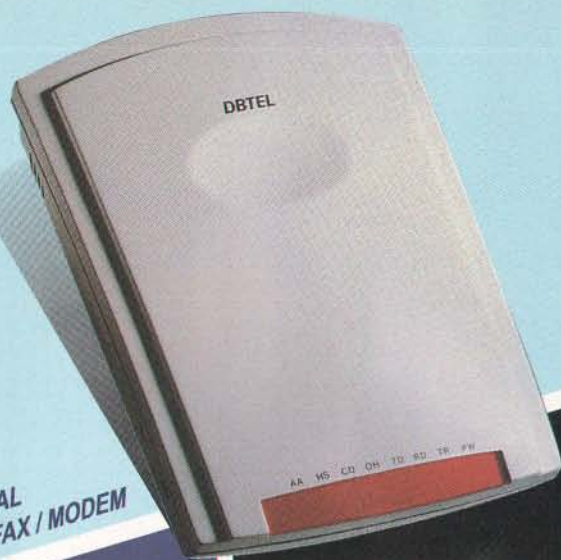
LANSource Technologies Inc.
Toronto, Canada
Tel: (416) 535-3555
sales@lansource.com
www.lansource.com

LANSource UK
Tel: 01954 782799
sales@lansource.co.uk

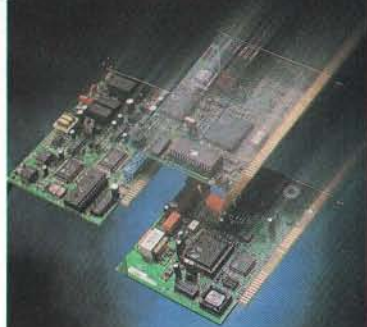
... IPX ... Net Bios ... Net Bieu ... TCP/IP UDP ... IPX ... TCP/IP ... IPX ... Net Bios ... Net Bieu ... TCP/IP UDP ...

A LEADER IN GLOBAL COMMUNICATION AND COMPUTER

- ISO-9001 Certified
- 17 years of telecommunication excellence
- Three professional R&D centers worldwide
- Three factories in prime manufacturing locations
- Top 4 CPE manufacturer in the world
- Leading specialist in wireless and inkjet technology
- World class data communication and optical storage device manufacturer



EXTERNAL
VOICE / FAX / MODEM



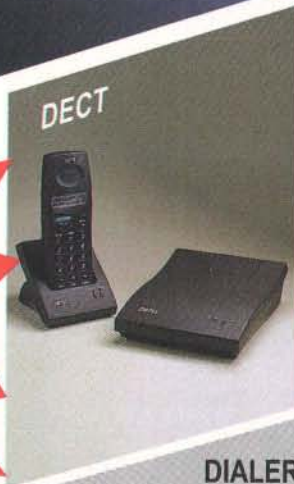
Voice/Fax Modem Internal



INK JET FAX 810



8X / 12X CD-ROM Drive



DECT



SST 8202



Caller ID 604



GSM

NEWS!

Also
Wireless LANs
coming soon.

DBTEL

DIALER AND BUSINESS ELECTRONICS CO., LTD.
No. 29, Tzu Chiang Street, Tu-Cheng, Taipei, Taiwan, R.O.C.
Tel: 886-2-268-2081 Fax: 886-2-268-1964 or 268-1965
E-MAIL (INTERNET ID): dbtel@smtp.dbtel.com.tw
'96 Comdex / Fall Booth No. S3019

OEM / ODM Welcome

Europe's Internet Infrastructure

The service you get from European ISPs depends on more than bandwidth.

By Valerie Thompson

The key to good response times on today's Internet is your Internet service provider's IP experience and the line capacity and throughput rates the ISP offers you. But capacity is not all. When traffic moves out of the local hop into the Internet backbone, it's the ISP's connectivity to the backbone that counts.

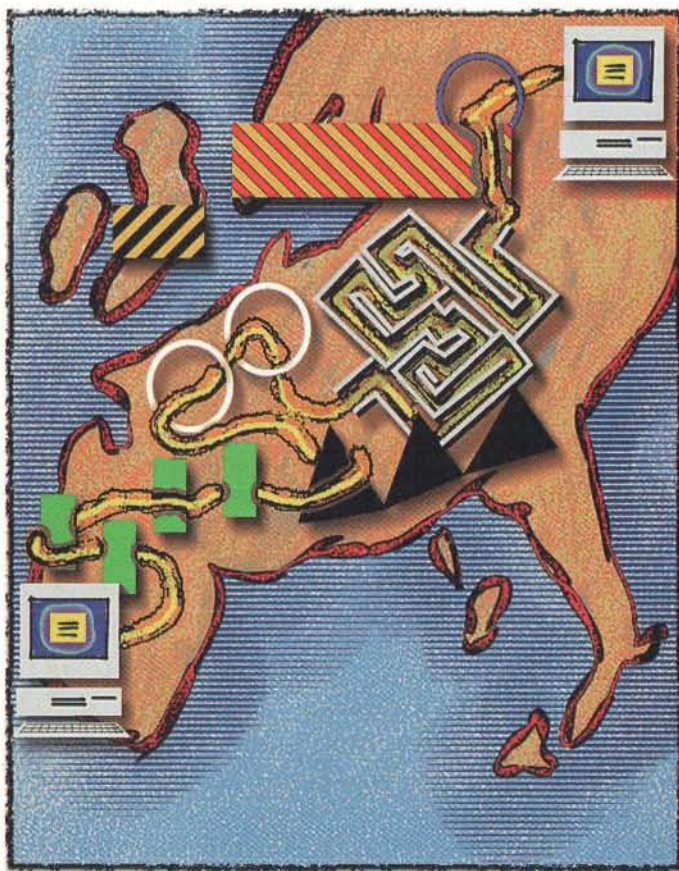
Today more than 600 ISPs rival for customers in Europe. Half of these providers have been on the scene for less than a year. To the home or small-office user, retail ISPs may more or less look the same and differ just by pricing structure. However, for corporate users, the quality of service and the overall data throughput vary greatly.

Don't think that just because an ISP is small it cannot offer good performance. One of the neat things about the Net is that a small ISP with a 64-Kbps line to the Internet can still provide speedy response because most of its subscribers are "low-power" users. A big ISP might have a 2-Mbps line to the Internet, but it may also have a lot of subscribers plus a few real power users who clog the link to the backbone. That's why you should look beyond just the links.

At its most basic level an ISP is nothing more than a rack of modems or ISDN boards, a server, a router, and some communications and billing software. The ISP typically connects all this equipment to the Internet with a leased line. That link into the Internet is crucial to the service the ISP's customers are going to get.

The connection to the Internet might involve a hop (routing point) to a regional IS wholesaler. From that point the ISP links to one of the European Internet backbones. Knowing how ISPs

are connected gives you an idea of the performance you can expect. That's where CyberRoadMaps, such as the one provided by market researcher EuroInternet, can help (for more information, see <http://www.marktplatz.ch/eurointernet>). These maps show how more than 2000 ISPs in various countries in Europe, as well as providers in North America, Japan, and Australia, connect to Internet backbones.



World Wide Wait

The ad hoc nature of the Internet more than often converts the World Wide Web into the World Wide Wait. Data packets sometimes travel around the world once or twice before they find their destination. This may even be the case if the server you need to locate is in a neighboring city.

This situation is prevalent on both sides of the Atlantic; however, the European Internet backbone is by far not as efficient as the North American. "Europe has 20 to 30 percent of the Internet's traffic, but it produces 80 percent of people's [Internet] nightmares," as a manager of a European ISP recently put it.

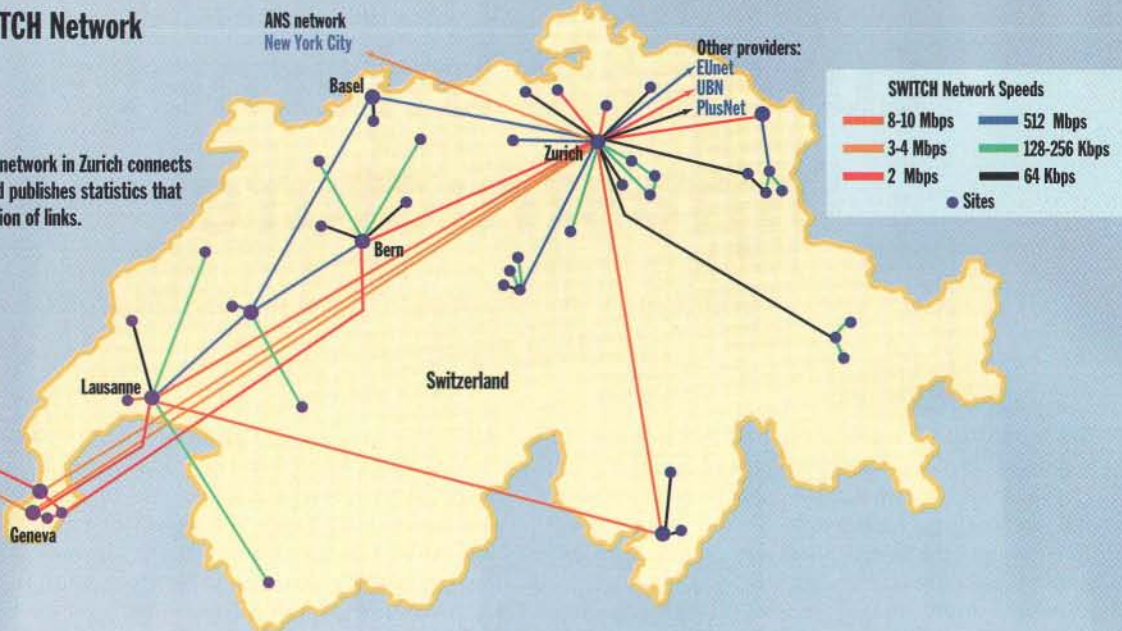
The main bottlenecks in the European portion of the Net, according to a recent analysis done by EuroInternet, occur at three points: country-to-country, backbone-to-backbone, and Europe-to-U.S. links. At these key points, insufficient bandwidth slows down the traffic. One reason for this unfortunate situation is the high cost of international and transatlantic leased lines in Europe, further aggravated by fluctuating and unfair prices between the U.S. and Europe. In many cases, European backbone providers have to pay an additional fee to connect to the States, whereas U.S. providers can link to

The SWITCH Network

The SWITCH network in Zurich connects 100 sites and publishes statistics that show utilization of links.

Backbone networks:

EBONE
HEPNET
EuropaNET



the European backbone for free.

Unlike the U.S. portion of the Internet, where tariffs are based only on distance, European backbone providers have to deal with prohibitive international tariffs whenever the network crosses the border from one country to another. Steep prices of leased lines supplied by Europe's PTTs are the main culprit. "We remain heavily penalized by monopoly tariffs for leased lines as well as ATM [asynchronous transfer mode] connections," says Brian Carpenter, group leader of Communications Systems at the CERN research center in Geneva, Switzerland, and chair of the Internet Architecture board.

Backbone Bottlenecks

After 1998, tariffs for leased lines will drop as a result of increased competition fos-

tered by a more liberalized European telecommunications market. But one Internet analyst says the transatlantic and cross-border links are not being used optimally. "International backbone providers are often reluctant to interconnect because of competitive pressures," says Jim Romaguera, principal consultant at EuroInternet. "They fear that smaller ISPs could be able to offer better services for lower prices to their customer base."

It is the nature of today's Internet that two ISPs in the same country often are not connected to each other. The result: Data sent from one ISP to another in the same region travels via the U.S. These expensive Europe/U.S. links carry traffic that actually should remain in Europe.

What is required is that more ISPs connect via commercial Internet exchanges

How to Choose an ISP in Europe

It's not just price that makes for a quality Internet service provider. To help find the appropriate ISP:

- ✓ Ask for network utilization data.
- ✓ Check the ISP's connectivity to the backbone and watch the number of hops to the backbone.
- ✓ Ask for the number of users per modem line.
- ✓ Evaluate the competence of the help-desk staff and the cost of support.
- ✓ Look for roaming services in other regions and countries.

Types of ISPs in Europe

Backbone providers offer international, intra-continental, and intercontinental networks to other ISPs. Typically they have high-speed links and hubbed networks. In Europe these backbone providers are:

EUnet (<http://www.eu.net>)

EBONE (<http://www.EBONE.net>)

Pipex-UUNET (<http://www.pipex.net>)

EuropaNET (<http://www.dante.net>)

Sprint (http://www.global_one.net)

NORDunet (<http://www.nordu.net>)

Telecom Finland (<http://www.inet.fi/telecom> or <http://www.tele.fi/>)

Unisource (<http://www.unisource.nl>)

France Telecom (<http://www.francetelecom.fr>).

National or regional ISPs resell Internet connectivity to local ISPs and act as retail ISPs themselves. They often have multiple links to the Internet.

Local or retail ISPs are small companies with one or two lines to the Internet. This category includes proprietary on-line service providers with Internet gateways, such as CompuServe or AOL/Bertelsmann Online.

Commercial Internet exchanges (CIXes) occur at the backbone or wholesale level. They are neutral interconnection points that in some countries connect only to the backbone; in others they also link up with regional and local services.

THE NEXIS PRO MULTIMEDIA SYSTEM



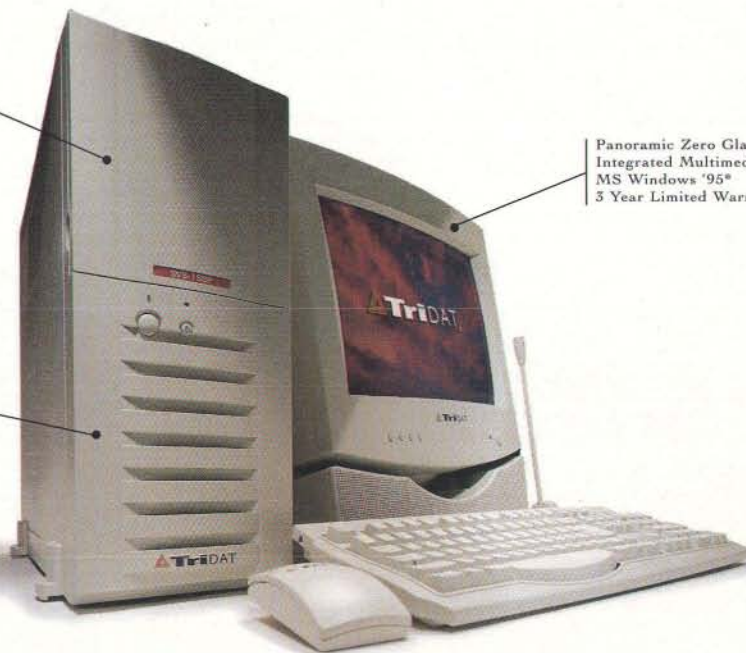
FIRST AMERICA, NOW THE WORLD.

The 7th Wonder of America is Now The Wonder of Planet Earth.

120-200 MHz Intel Pentium Processor®
Lightning Fast EDO RAM
256/512 KB Pipeline Burst Cache
Advanced ATX Chassis

Panoramic Zero Glare Monitor
Integrated Multimedia Speakers
MS Windows '95®
3 Year Limited Warranty

ATI 64-bit MPEG Video
Intel Chipset
Digital Wavetable Stereo Sound
8X Multimedia CD ROM Drive



ENTER OUR WEBSITE CONTEST:
<http://www.tridat.com>
Silicon Valley Solutions, Inc.
San Jose, California, USA
Ph: (408) 920-0656 / Fx: (408) 920-0659

Circle 727 on Inquiry Card (RESELLERS: 728).



© 1996 Silicon Valley Solutions, Inc. All rights reserved. Silicon Valley Solutions, Inc. cannot be responsible for errors and/or omissions in typography. Intel Inside is a registered trademark of Intel Corporation. All other trademarks are trade properties of their respective companies.



PCs • NOTEBOOKS • SERVERS • MADE IN U.S.A. / SILICON VALLEY

(CIXes) to relieve the intercontinental traffic jams. CIXes were originally set up to free commercial service providers from the policies that were restricting use of the Internet to educational and research purposes only. The development of CIX points is crucial to the European Internet infrastructure because it will avoid

routing data over the already congested and expensive transatlantic links. The six major European CIX points today are in Helsinki, Paris, Amsterdam, Geneva (CERN), London, and Stockholm (see <http://www.isi.edu:80/div7/ra/eu.html>).

The original idea behind CIXes was simple: Commercial ISPs would agree to

route traffic over each other's networks without restriction or additional charges. However, because CIXes deploy sophisticated communications protocols and global guidelines, some CIXes don't accept interconnection with smaller commercial ISPs.

Another way to release pressure on the transatlantic links is as old as the Internet itself: caching of popular sites locally to relieve traffic on the remote server and the network. This method was fine when research and cooperation were the spirit of the Net, but now that business is being done there, it creates a new set of problems. Is copyright being violated by ISPs who choose to cache sites locally? What about all the user information the site owner gets when people visit the site? If pages are stored elsewhere, those valuable statistics will not be available to owners of the site.

Trace the Route

For its report "The Global Internet—Featuring CyberRoadMaps," EuroInternet surveyed data packets traveling on the

Internet Access Prices Vary

ISP rates for PPP connections (dial-up connections) differ dramatically. For example, an ISP in the U.K. offers unlimited time and data volumes for about \$15 a month. This is one of the lowest rates in the U.K. The rates in Germany are in general the highest in the European Union. In Switzerland, an ISP offers unlimited use for \$10 a month.

One ISP in Switzerland has apparently decided it doesn't want to attract dial-up users and has made its monthly fee about \$40 (plus usage charges). But because this provider has such a good reputation for service and response times, Swiss sub-

scribers who know the importance of performance are willing to dig deeper to pay.

More demanding needs of the corporate Internet subscriber have resulted in the development of value-added services. Prices vary and are, in fact, negotiable. Fees in general are much higher for Internet access when offered by the international and global providers, many of whom manage bigger networks that tend to be more reliable and available—thus the higher price. Basically, say industry insiders, the old unwritten rule applies to the Infobahn: "You get what you pay for."



We Bring a World of Experience to Data Communication

MAIN PRODUCT-LED, LCD and Rack Mounted

- * 2400bps(V.22)Series
- * 9600bps(V.32)Series
- * 14400bps(V.32bis)Series
- * 28800bps(V.34)Series
- * Network Management System(NMS)
for Modems

OEM/ODM WELCOME DISTRIBUTORS WANTED

The experienced members of ATRIE are highly qualified professionals who commit ourselves to continuously provide excellent modems with competitive price to their customers. The ATRIE V.32bis/V.34 Series Modems provide prominent functions i.e.2/4-wire Leased Line, NMS, Dial Back-up over Leased Line Operation, Call Back Security and Remote Configuration. For more information, please contact us immediately.

**ATRIE
TECHNOLOGY INC.**

10F, 14 Lane 609 Sec. 5
Chung Hsin Rd., San Chung City,
Taipei Hsien, Taiwan 241, R.O.C.
TEL:886-2-9995155 FAX:886-2-9994960
E-mail:atrie@ms1.hinet.net



Internet and calculated the number of different ISP subnetworks they visited on their odyssey. EuroInternet consultant Romaguera says this is the best way to locate bottlenecks and measure the performance of ISPs.

The most recent analysis from EuroInternet identifies nine Pan-European backbone providers and another nine organizations for the U.S. backbone. The regional and national providers connect to the backbone and act as Internet wholesalers. Some also offer retail services. Local or retail ISPs connect with one or two lines to the regional providers.

An example of an Internet wholesaler is the SWITCH network in Zurich. It connects more than 100 sites consisting of universities, engineering schools, R&D institutions, companies, and regional ISPs. A leased-line network links all organizations to other providers (EUnet, Unisource Business Networks) and to backbone networks (EuropaNET, EBONE). Two T1 links connect directly to the ANS network in New York.

SWITCH publishes statistics that show the link utilization at the three key points of the network (see <http://www.switch.ch/switch/lan/SWITCHlan-map.html>). For the customer this is an excellent service because it shows exactly the performance the ISP is able to provide.

To cope with the increasing demand for bandwidth, many backbone providers are developing a new infrastructure. Unisource Internet Access Services, one of the European backbone providers, for example, confirmed the establishment of a premium service network with hubs

in Amsterdam, Stockholm, London, Zurich, and Madrid, and with interconnections at all the CIX points in Europe. IBM and EUnet are currently at work on similar projects.

As the Internet continues to expand, peer-to-peer networks are expanding as well. These private networks offer added value such as roaming agreements or data-interchange services to large businesses. But it's important to remember that the public access an ISP can offer is directly tied to its amount of bandwidth and type of connectivity to the global backbone.

WHERE TO FIND

EuroInternet
Bern, Switzerland
+41 31 998 4331
fax: +41 31 998 4103
eurointernet@thenet.ch
<http://www.marktplatz.ch/eurointernet>

When it comes to these factors, Europe's local ISPs are far from equal. **B**

Valerie Thompson, based in Zurich, tracks telecommunications developments. You can reach her at 100271.257 @compuserve.com.

"What makes Velocis the fastest database?"

See us at:
SYSTEMS-Germany
SMAU-Italy
October '96

You do! Velocis™ Database Server offers more speed-enhancing features than any other DBMS. With architectural choices, Server Extensions, and multiple APIs, including SQL C-API, low-level C-API, and C++ class libraries, typical relational client/server database products just don't compare.

Velocis supports both relational and pointer-based network model databases in any combination, as well as processing on either side of the client/server equation.

The choices of operating platforms, APIs, processing localities (client or server), and database models can be combined to satisfy the performance requirements of virtually any application, regardless of size or complexity.

Call: 206-557-0200
Fax: 206-557-5200

If it's fast—it's

RAIMA™

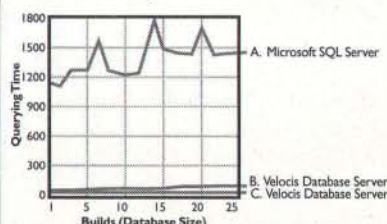
Test drive Velocis Database Server today at www.raima.com.

Raima Corporation, 1605 NW Sammamish Rd. #200, Issaquah, WA 98027 USA
Inside the U.S.: 1-800-275-4724, Outside the U.S.: 1-206-557-0200
Fax: 1-206-557-5200, Web: <http://www.raima.com>, Internet: sales@raima.com

Germany: 49 7022 9256 10 Singapore: 65 334 0061 Italy: 39 49 720 577, 39 49 80 77 140

Argentina: 54 1 470 72 03 Spain: 34 3 225 39 95 Raima UK Ltd.: 44 1 273 819 292 Australia: 61 2 419 7177
Denmark: 45 44 88 99 00 Raima Benelux: 31 35 694 4738 Colombia: 57 1 62 10 070 France: 33 1 446 100 42
Sweden: 46 13 311 588 Baltic States: 372 631 4009 Finland: 358 0 8045 130 Russia: 7 812 316 1965

Velocis Bill of Materials Benchmark



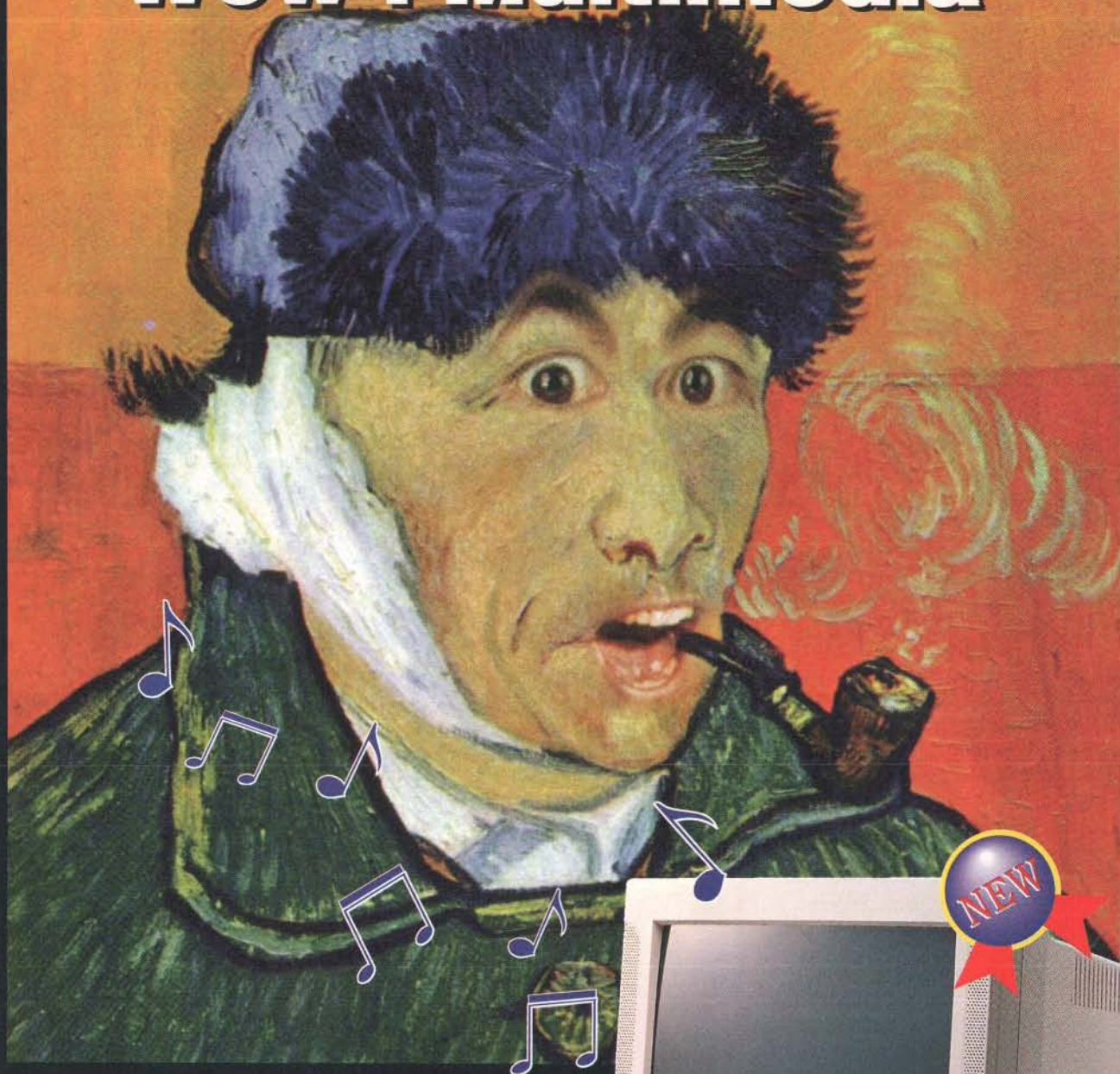
- A. Microsoft SQL Server provides relational architecture and supports database querying from the client through ODBC/SQL.
- B. Velocis ODBC/SQL with Server Extensions allows application partitioning where application level code resides and executes at the database server. Even relational model DBMSs benefit from server-side processing!
- C. Velocis low-level C-API with Server Extensions combined with the network model results in the fastest client/server database application performance possible.

For more information on what makes Velocis the fastest database, call for a copy of the *Velocis Bill of Materials Benchmark*.

Infrastructure Improvements

While many national Internet backbones already have 34-Mbps links, and there are some 34-Mbps links between one or two European countries, a pan-European 34-Mbps highway does not exist—yet. Unisource has announced plans to link Spain, Sweden, Switzerland, the Netherlands, and the U.S. at this speed. EuropaNET is developing a new pan-European 34-Mbps backbone that is primarily for research but will pave the way for development of higher-speed services across the Union. To make for better throughput to the United States, EUnet, Pipex/UUNET, and EBONE are adding a 34-Mbps link.

Wow ! Multimedia



An evergreen enterprise for the past 30 years and still growing strong !

1996 is our 30th anniversary. We invite you to join in the celebration of our achievements in a complete line of products from 9" and 14" color monitors up to our 15", 17", and even 21" monitors !

OEM/ODM Welcome !



MM6536SL



Manufacturer & Exporter

Suite 602, 136, Jan-Ai Road, Sec. 3, Taipei, Taiwan, R.O.C.

Tel: (886) 2 754-8353 Fax: (886) 2 754-8498 / 700-0471



Circle 739 on Inquiry Card (RESELLERS: 740).

Set-Top Madness

*Asian manufacturers are rushing to market
a new generation of set-top boxes.*

By Mark LaPedus

Asia, like other regions of the world, is testing the delivery of interactive digital TV services. Phone carriers and computer companies are paving the way for Asian consumers to have a range of services—Internet connections, video on demand (VOD), pay-per-view, interactive shopping, electronic commerce, and more—delivered through their TVs, enabled by a so-called set-top box.

The initial demand for VOD services has been slower than expected. The high cost of these services and disparate networking infrastructures present major problems. Another important issue is that the worldwide standards for set-top-box design have been a moving target, according to Steven Chao, the director of digital/video technology for Taiwan's Computer & Communication Research Laboratories (CCL), a government-backed R&D organization that is part of a major consortium developing set-top boxes. "It's also a business issue," notes Chao, adding, "How much are customers willing to pay for them?"

What's in the Box

But most analysts concur that, when it finally develops, the market for set-top boxes and related services will be tremendous. Companies are beginning to rush their products to market, at prices ranging from \$200 to \$300. Today's first-generation set-top boxes offer more than a multitude of TV channels; they're flexible platforms that connect to various networking architectures and consumer-electronics gear. Follow-up products will contain a slot for a smart card, which will give users a secure way to conduct transactions over cable networks.

Standard set-tops are stand-alone units that connect directly to a TV. Other models will support wireless transmissions; direct broadcast satellite (DBS) services, such as DirecTV; and

the Multichannel Multipoint Distribution System (MMDS), which uses multiple local terrestrial microwave transmitters located in metropolitan areas to get a signal to homes. Other box vendors are taking different approaches. For instance, aside from their standard set-top lines, NEC and Samsung are integrating set-top-box functions into some of their PC lines.

In what appears to be a collision—or conversion—course between PCs and TVs, some set-tops also run real-time OSes

and Java applets, which allows the boxes to double as TV Internet surfers if they're connected to the Web. Since some cable companies offer broadband data connections on their networks, some set-tops also feature Ethernet connectors that allow you to download information from the Net.

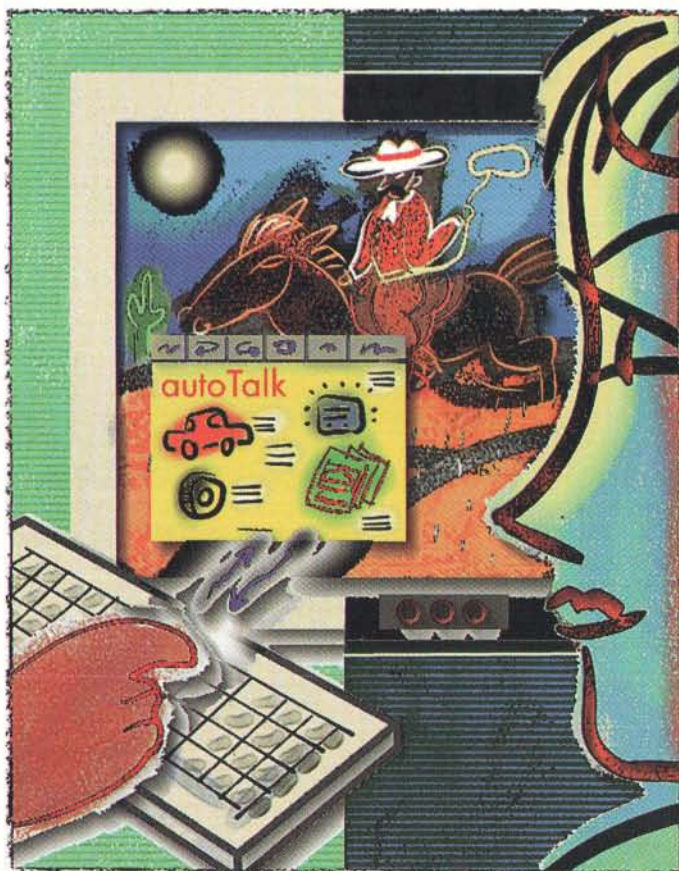
Asian countries are expected to embrace a combination of standard and wireless set-top boxes that will connect to current and future consumer-electronics devices as the home moves from analog to digital. Future set-tops will support the emerging IEEE-1394 digital interface standard, which specifies the way PCs and consumer-electronics devices exchange data.

The Network Connection

According to analysts, the major issue in Asia is how to link a set-top box to dispa-

rate (and sometimes poor) networking infrastructures. Future set-tops will incorporate so-called network interface modules (NIMs), which will allow them to support a bevy of protocols: Asymmetric Digital Subscriber Line (ADSL), hybrid-fiber-coaxial (HFC), and Fiber to the Curb (FTTC, also known as switch digital video). Wireless boxes will support DBS and MMDS.

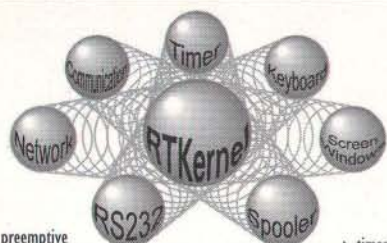
Basically, ADSL uses specialized modems to transmit signals over an existing twisted-pair telephone wire. A typical ADSL system supports a downstream rate of 6 Mbps and an upstream rate



Professional Real-Time Tools

RTKernel Real-Time Multitasking for DOS and 16-Bit Embedded Systems

- Real-Time Multitasking for: Borland C/C++, Microsoft C/C++, or Borland Pascal
- RTKernel supports: MS-DOS 3.0 or higher, Embedded Systems without DOS, Paradigm Tools (info available), Turbo Debugger, CodeView



- preemptive and cooperative scheduling
- up to 64 priorities
- your program's functions run as parallel tasks
- Windows can run in parallel with RTKernel tasks
- inter-task communication
- timer with 1 µs resolution
- real-time capabilities through event-driven scheduling
- drivers for screen, keyboard, up to 38 COM ports, IPX services, floppy disks, hard disks, etc.
- through Shared Code/Data, semaphores, mailboxes, message-passing
- unlimited number of tasks, about 1K per task needed
- timer rate adjustable from 0.1 to 55ms

Developer's License: \$550
complete Source Code: add \$500
no run-time royalties

RTTarget-32 Cross Development System for 32-Bit Embedded Systems

- 32-Bit Development System for: Borland C/C++, Microsoft C/C++, Watcom C/C++
- RTTarget-32 supports: Intel 386/486 EX/SX/DX(2), as little as 16K RAM/ROM



- boot code for floppy, hard disk, EPROM disk
- optional paging and RAM remapping
- FLAT memory model with physical = logical addresses
- interrupt latency < 5 µs
- serial communications library
- privilege level 0 or 3
- locator for Win32 PE-files
- program download at 115200 baud
- supports standard PCs and controller boards
- fully supports the C/C++ run-time systems (printf, malloc, etc.)

Developer's License: \$1700
complete Source Code: add \$1000
no run-time royalties

On Time MARKETING

Professional Programming Tools

Free demo disk! <http://www.on-time.com>
Please request Info Kit B <ftp://on-time.com>
info@on-time.com

On Time Marketing Karolinenstrasse 32 20357 Hamburg GERMANY Phone +49-40-437472 Fax +49-40-435196 CompuServe 100140,633	Australia Microway Denmark Ravenholm France Technology Rescue Italy Silicon Valley Malaysia Pentamaster Russia ProSoft Sweden Databiten Sweden Linsoft USA On Time Marketing	(03) 9580-1333 44889900 1-30660136 (049) 871-3444 (04) 642-2595 (095) 971-2059 (026) 256493 (013) 111588 (516) 689-6654
---	--	---

International

Set-Top Madness

of 64 Kbps. Meanwhile, HFC uses an existing cable-TV network; however, this bandwidth must be shared among several hundred subscribers using interactive services.

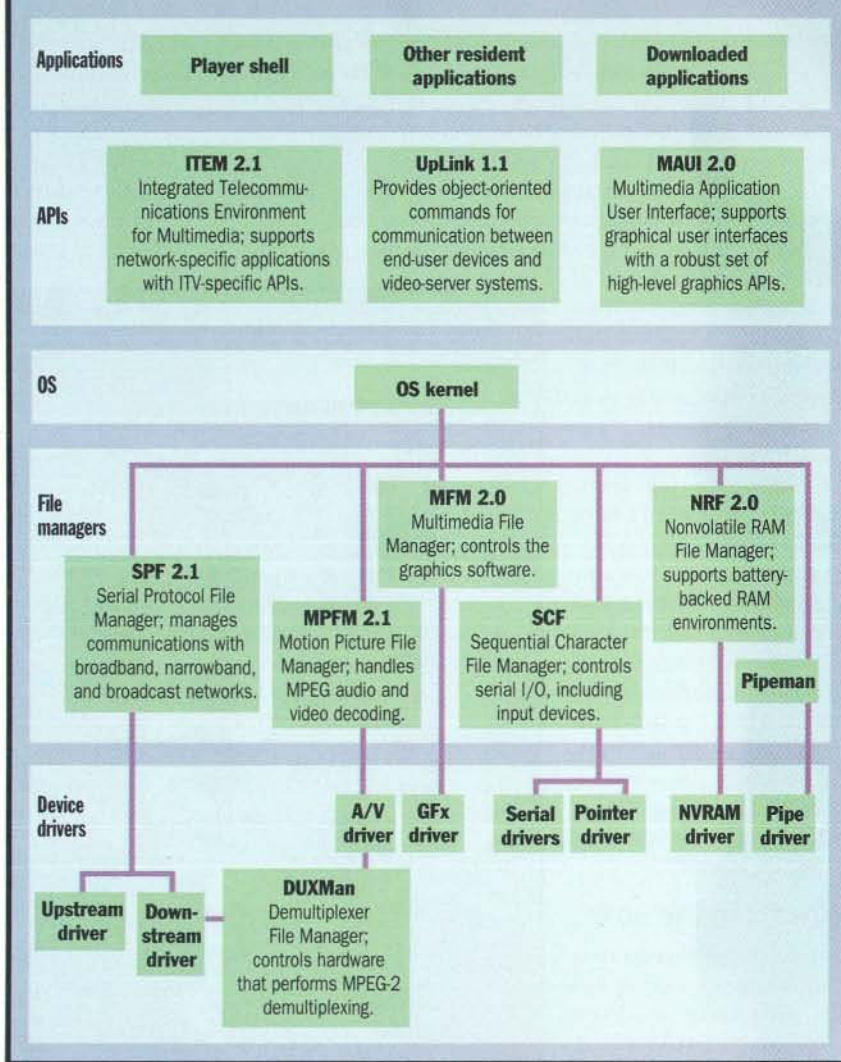
Switch digital video calls for fiber-optic cable to be strung to a neighborhood, with a portion connected by coax-

and/or bit-mapped images, modulation/demodulation chips, and forward-error-correction ICs.

According to the Interactive Multimedia Association, there are six types of set-top boxes. Below are some details about these six types.

Class 1 and 2 boxes are low-end, ana-

David 2.1 Software Architecture



More than 20 set-top-box manufacturers chose the David API because of its compact, modular architecture.

ial or twisted-pair wire. Such a network might require the use of asynchronous transfer mode (ATM), a cell-switching technology with data rates starting at 1544 Kbps. For interactive-TV services, a set-top box requires several components: a CPU, an NIM, an MPEG-2 audio/video decoder, a real-time OS, main and graphics memory for use in displaying menus

log-based units built around a CISC microprocessor unit (MPU), usually a 386 or a 68020/30. These boxes have little or no capacity for transmitting, but they support cable channels and pay-per-view TV.

Class 3 and 4 boxes also employ CISC MPUs. They provide more functionality by retaining some return-channel bandwidth capabilities while splitting the

download channel between analog and encoded video. Class 4 units offer more digital interactive services.

Class 5 and 6 boxes are all-digital units that support a full range of interactive-TV services. Class 5 units have a downstream path that's wider than the upstream path, while Class 6 units have equal bandwidth for sending and receiving. Class 5 and 6 boxes use embedded RISC CPUs, such as the PowerPC, from Motorola and IBM; R4000 variants, from LSI Logic or others; and the MicroSparc, from Sun.

Many RISC MPUs integrate the CPU core, analog descrambler, and network-security interface. Like Class 3 and 4 units, the high-end boxes use MPEG-2 for audio/video compression. Many MPEG-2 chips enable PAL-format video, with a full-screen, 16-color on-screen display and only 16 Mb of DRAM.

Set-tops will also support one or more real-time OSes, including Integrated Systems' pSOS, Microware's OS-9, and the Thomson-Sun Interactive Alliance's Open-TV. These boxes must also support several international standards, which are being devised by a new consortium, the Digital Audio/Visual Council (DAVIC).

A Special OS

Set-top OSes are generally kernel-based, scalable software platforms that offer support for CISC and RISC processors as well as provide multitasking functions in real time. This is important for embedded applications, explains Doug Lewis, manager of Asian business development for Microware Systems (Des Moines, IA).

Microware's OS-9 is bundled with Spyglass's Web Technology Kit. This allows Microware's OS-9 to support Internet-access capabilities for several types of electronic appliances: Web-enabled TVs, network computers, pagers, digital cameras, cellular phones, and others. Microware's OS is also bundled with the Java programming environment, enabling the use of Java applets on OS-9.

One of the first VOD trials in Japan is a collaboration between Nippon Telegraph and Telephone (NTT) and cable-TV operators in Tokyo, Chiba, and Kanagawa. The trial, which started in July 1995 and runs through March 1997, calls for 300 households to use a set-top box via NTT's fiber-optic network. Telephone services use a 64-Kbps ISDN network.

A separate VOD trial now taking place near Tokyo, which will also run through

March 1997, is being conducted by NTT and Silicon Graphics, Inc. (SGI). This trial uses SGI's set-top box, a custom unit built around a Mips R4000 RISC CPU. Last spring, NTT, CATV Yokosuka, and Microsoft launched a similar program.

NEC, Pioneer, and Toshiba are among the major set-top-box vendors in Japan. NEC's new box, the Broadband Access System-2000, is based on a PowerPC chip that runs OS-9 and supports switch digital video, ADSL, MMDS, DBS, and HFC. It handles NTSC/PAL video signals, while decoding is done via MPEG-2 over a 15-Mbps transport stream.

NEC's box can support narrowband services, such as plain old telephone service (POTS), narrowband ISDN, and Internet access. The optical network unit can support narrowband signals via T1 or E1 interfaces. NEC's ADSL system can transport signals via ATM cells using the ADSL format. The downstream bit rate is 6 Mbps; the upstream rate is 64 Kbps. A typical price for a set-top box in Japan runs from 20,000 to 30,000 yen.

Karaoke on Demand

Late last year, NEC was picked as the set-top-box vendor for a major VOD contract in Hong Kong. NEC's box is built around IBM's PowerPC. Hong Kong's VOD provider, Hongkong Telecom-IMS, has delayed its VOD trials until 1997, when it will offer VOD, karaoke on demand, electronic commerce, home shopping, and pay-per-view TV.

Hongkong Telecom-IMS will carry its interactive-TV services via an ATM or broadband ISDN network. Applications servers will supply Java over dial-up connections across the ATM network. Two-way communications will take place across this ATM connection via TCP/IP protocols. Video content sent out from the server will be in MPEG-2 form. It will then be decoded by a hardware chip in the set-top box and turned into an analog signal for transmission to the TV, according to William Lo, president of Hongkong Telecom-IMS.

Meanwhile, Taiwan is also endorsing the PowerPC in a set-top-box/VOD pilot program. This set-top box comes from a newly formed consortium led by Acer, CCL, and Tatung. Taiwan's Interactive TV consortium consists of some of the island's other PC and consumer-electronics vendors: ADL, First International Computer, Mitac, and Sampo, as well as some

www.cqk.com

47,000 PRODUCTS — ONLINE ORDERING

Multimedia

SoundBlaster 32 Plug N Play OEM 115 808
Macromedia Director 5.0 2252
Proxima Ovation 820 Active 5010
Radius VideoVision Telecast 207
Turtle Beach Tropez + ...3854
TrueVision Targa 2000 139

Backup

Colorado Taravan 1000 Internal 139
Exabyte 8205 7GB 1/E 1259/1500
Exabyte 8505 14GB 1/E 1861/2103
HP DAT 2/4/8/16GB 562/660/840 270
Surestore 2/4/8GB/734 2881
IONEGA IAZ 1GB 1/E 2881
IONEGA 7000 2881

Modems/FAX

BOCA 28.8 V.34 1/E 109/163
Etech 28.8 V.34 Int/Ext 100/125
Hayes Optima 28.8 V.34 370/430
Multitech All Models CALL
Paredata SatisFaxion 500 Int 420
Shiva Net Modem 807
Supra 33.6 1/E 131/147
USR Courier V.Everything 237
USR Sports 33.6 1/E 237
USR Courier 237

Chips

CPU (Intel, Cyrix, AMD, DX4, PENT) CALL
SIMM - ALL CONFIGURATIONS CALL

All Upgrades — AST, Apple, Compaq, DEC, HP, IBM, Silicon Graphics, SUN, Toshiba

SIMM & PROPRIETARY MEMORY — Call For Today's Price

pentium™
PROCESSOR
and Pentium Pro: TOO LOW to print!

Network

Novell Netware 3.12/4.1/5/NT CALL
3COM Etherlink III Combo Bulk 79
3COM Fast 100Mbps TP PCI 32bit 158
3COM LinkB 12port 100Mbps Hub1930
Compaq IPG - All models CALL
Cisco Bridge & Router CALL
Intel EtherExpress Pro PCI 100 208
NE 2000 Compatible 35
NE 2000 Plus 75
NE 5500 110
SMC EtherEZ/CD/TP/Cbo 88/88/98
SMC EtherEZ PCI Combo 159
SMC EtherPower PCI 10/100mbit 153
5 PACK/20-PACK/50-PACK/100-PACK

OS/Etc.

Windows NT 4.0 Server +S 741
OS/2 3.0 Warp CD-ROM 132
Sun JAVA Workshop NT 200
Sun Netscape Commerce 690
Solaris DT 480
Solaris 230
Windows 95 on CD 90
Sun Firewall Lite 3400
ALL OS available - please call for price

CD-ROM/Optical

Teac CD-56E 100
Toshiba SCSI 5402B 125
Creative IDE 8X 110
Fujitsu Mop/Opt 230MB 3.5 Ext 432
Pinnacle RCD5040 1/E 812/902
Smart&Friendly Recorder 591/697

47,000 Item Catalog
Program with
Current Prices
Free with
Order

PHONE: (415) 861-8330

Español/François: (415) 861-8376

FAX: (415) 861-8380

email: sales@cqk.com

Dealer Discounts
Quantity Discounts

Low freight rates—US and International • No handling charge • Prices are for cash pre-payment • VISA/MC/AMEX accepted • Products may be USA versions • Defective returns for replacement only • Prices are FOB USA and subject to change • 15% restocking charge on all nondefective returns • No returns on open software • All trademarks are the property of their respective owners

Computer Quick, 165 - 8th Street, #309,
San Francisco, CA 94103, USA

Web-Browsing from Your TV

The set-top box will appear in many forms. Philips and Sony recently licensed a hybrid set-top/network-computer technology from WebTV Networks (Palo Alto, CA). They won't release the final specs of their boxes until this fall, but they claim their systems will connect to a TV and a phone line.

Such boxes allow you, via remote control, to change TV channels, surf the Internet, get e-mail, and access WebTV's own on-line service without the hassles and delays of going through an on-line provider on a PC.

The feature-rich Sony and Philips set-top boxes will sell for \$200 to \$400. The companies licensed two components from WebTV: WebTV Reference Design and WebTV Network, the on-line service. The Reference

Kit includes software and hardware guidelines for making a set-top. Built around Integrated Device Technology's 112-MHz R4640 RISC chip, the WebTV-based box comes with a 33.6-Kbps V.34bis modem, memory, 16-bit stereo, and an on-the-fly decompression technology.

The box's patented Worldscan technology allows Web content to appear on all TV formats. Company officials would not disclose what OS the box will run. But it comes with its own WebTV browser, which is compatible with HTTP, Multipurpose Internet Mail Extensions (MIME), and Hypertext Markup Language (HTML) 3.0; virtually all extensions of Netscape Navigator 3.0; and Microsoft's Internet Explorer.

Have you lost your memory lately? When was the last time you were lost in the dark?

Best Protection From Main Power

Established in 1989, we have rapidly become one of Taiwan's premier developers of uninterruptible power systems. We are constantly developing new and innovative products designed to meet your requirements today and into the future.

The Total Solution

In addition to UPS products, we also offer a full line of UPS monitoring and shutdown software products available for most operating systems.

**The UPS of the Future
.....Today**



Line Interactive UPS
600VA-1400VA



True On Line UPS
600VA-2000VA

Standby UPS
300VA-1200VA

See us at
**COMDEX/Fall,
Sands Expo
#S3019F3**



MAIN POWER ELECTRONICS CORPORATION

5F1, No.2, Alley 9, Lane 45, Pao Shin Rd., Hsin Tien City, Taipei, Taiwan, R.O.C.

TEL: 886-2-9180636 FAX: 886-2-9180657

E-MAIL: mpower@tpts1.seed.net.tw

multinational corporations, including Philips and Matsushita.

Acer's box, the AcerStar, will ship early next year. It's built around IBM's 403 version of the embedded PowerPC, and it runs OS-9. Once it hits mass production in 1997, the Acer box will sell for about \$300. It includes an MPEG-2 chip and 3 MB of memory, and it supports the European Digital Video Broadcast (DVB) standard. "DVB, which is getting support in the U.S., has a good descrambler system for encryption and decryption purposes," says Charlie Wang, R&D director for Acer's

set-top-box project.

Tatung, one of Taiwan's largest consumer-electronics companies, also has a new set-top box, the TDS-403D. Like the AcerStar, the TDS-403D is based on the PowerPC and uses an MPEG-2 chip for compression/decompression.

Samsung is playing a major role in Korea Telecom's (KT's) VOD pilot project, which is taking place in Seoul. Fifty subscribers in the Yoido area have been able to enjoy movies, drama, documentaries, and karaoke by placing an order through a telephone line to KT's VOD server. In the trial, Samsung is developing and providing an ATM switching system, an ATM multiplexer, ADSL, set-top boxes, and other systems. Meanwhile, Digital Equipment provides the video server, consulting, and systems integration.

The set-top box may take yet another form in the future. Like NEC, Samsung, and others, Acer may integrate set-top functions into its PCs. "The PC will likely integrate the set-top, the DVD [digital videodisc] player, and other devices," Acer's Wang says. "But eventually, we see the stand-alone set-top becoming the home server for distributing information to the PC or other appliances in the home. With the set-top, you can receive video information or telephone signals. In a sense, the set-top becomes the cornerstone in the home." **B**

Mark LaPedus is a BYTE contributing editor based in Taipei. You can reach him by sending e-mail to 5916955@mcimail.com.

WHERE TO FIND

Acer, Inc.
Taipei, Taiwan, R.O.C.
+886 2 545 5288
fax: +886 2 545 5308
<http://www.acer.com/>

fax: +81 44 435 5425
http://nec.co.jp/index_e.html

Computer & Communication Research Laboratories
Hsinchu, Taiwan, R.O.C.
+886 035 917 743
fax: +886 035 820 044
a000@cclol.ccl.itri.org.tw

Nippon Telegraph and Telephone Corp.
Tokyo, Japan
+81 3 5200 9136
fax: +81 3 5200 9135
<http://www.ntt.jp/>

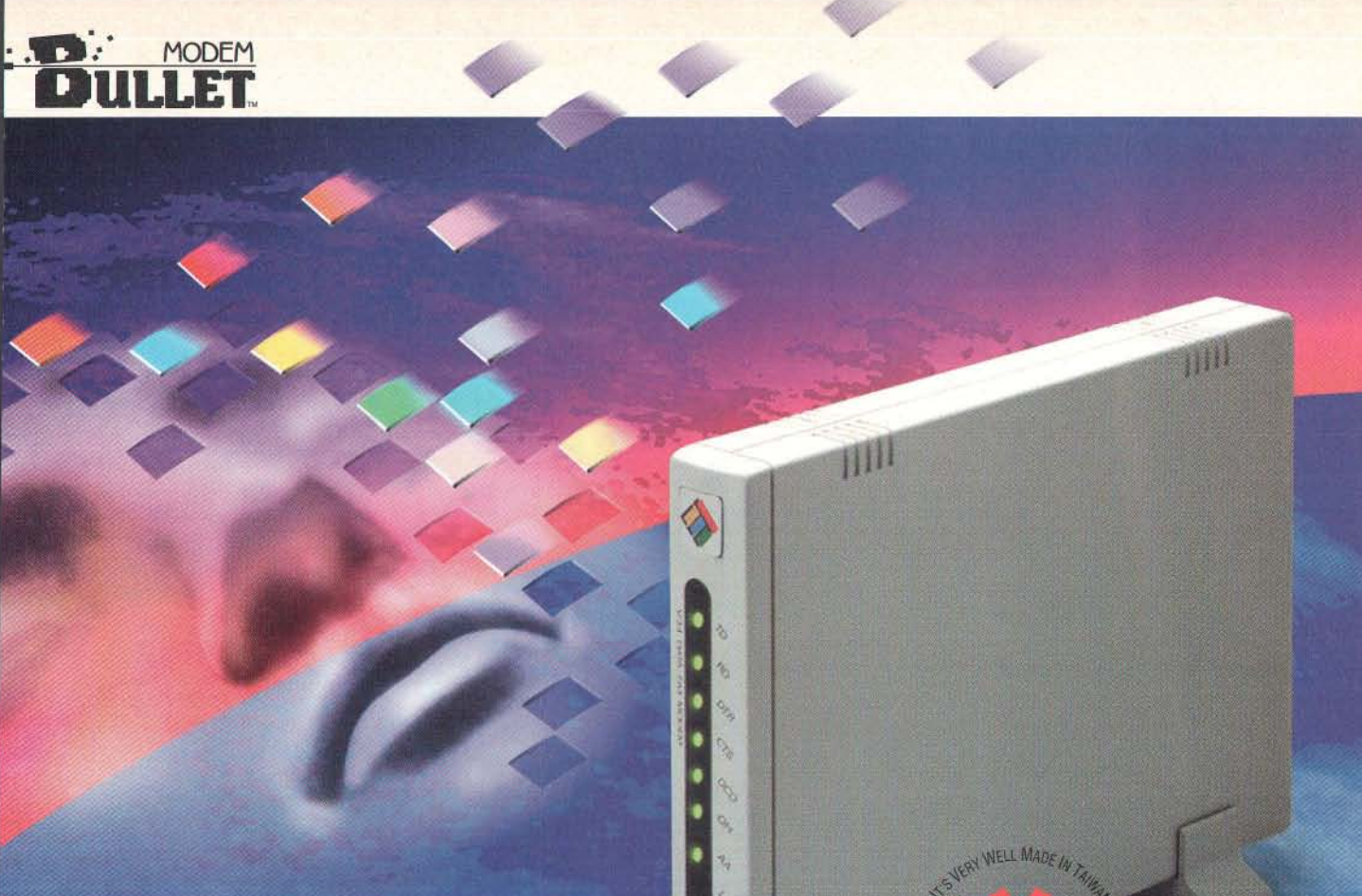
Samsung Electronics Co., Ltd.
Seoul, Korea
+82 2 727 7833
fax: +82 2 727 7985

Hongkong Telecom-IMS, Ltd.
Hong Kong
+852 2888 2888
fax: +852 2877 8877
wlo@hkt.com.hk
<http://www.netvigator.com>

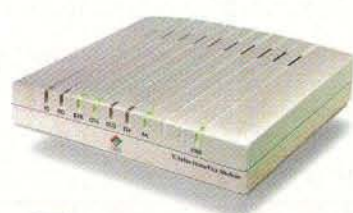
Tatung Co.
Taipei, Taiwan, R.O.C.
+886 2 592 5252
fax: +886 2 591 6443

WebTV Networks, Inc.
Palo Alto, CA
(415) 326-3240
fax: (415) 326-5277

NEC Corp.
Kanagawa, Japan
+81 44 435 5260



Connecting the world with E-TECH



E336RX New V.34bis 33,600bps SERIES

- 33.6k bps modem with 14.4k bps fax
- Supports ITU-T V.34bis, V.34, V.32bis, V.32, V.22bis, V.23, V.22, V.21, Bell 212 & 103 standards
- DTE 115,200bps, DCE 33,600bps
- With V.42bis, MNP5 Data compression
- G3 Fax Compatible 14,400 bps send and receive
- Data / Fax / Voice Function
- Worldwide PTT Approvals
- Supports windows 95

TA717

ISDN TERMINAL ADAPTER

Advanced Features:

- Basic Rate ISDN Access
- Two Analog Ports Supported
- High Speed V.24 Data Port up to 115,200bps
- Asynchronous-to-Synchronous PPP Conversion
- V.120 and V.110 Rate Adaptation
- X.25 on D Packet Data Application
- Multiple Subscriber Numbering(MSN)
- Calling Line Identification Security
- Easy-to-Configure AP Supported
- 10 LED Status Indication

Gain

Subscriber Line Digital Multiplexer

Advanced Features:

- Optional Network Management System
- Low Power Consumption
- No Remote Battery Needed
- Flexible Alarm System
- High Voice Transmission Quality
- Fax and Modem Channel Quality
- Easy Maintenance
- Freely Mix 1+1, 1+3 and 1+7 in COT

H-PIPE

HDSL Transport System

Advanced Features:

- Low Cost, HDSL Transmission Technology
- Repeaterless E1 / T1 Service, Connects at Distances Up To 6 KM (E1) / 7.2KM (T1).
- Modular Design, Easy Installation and Maintenance.
- Fiber Optic Quality Over Existing Copper Cable Multiple Interface Options .
- Network Management System for Remote Monitoring.

Circle 729 on Inquiry Card (RESELLERS: 730).

See us at Comdex Fall '96
November 18-22
Booth NO: Hilton Convention
Center H1100



E-TECH, INC.

30, R&D Road 2, Science-Based Industrial Park, Hsin-Chu, Taiwan, R.O.C.
TEL: 886-35-774991 • FAX 886-35-777751 internet: <http://www.e-tech.com.tw>
E-Mail: service@ml.e-tech.com.tw



Enjoy Pursuit Enjoy Computing



MITAC navigator, Discovery
3-language OCR fax-scanner
Software bundle worth over US\$1,500
Front-centered IrDA transceiver/receiver
Windows® 95/MS keyboard & mouse
166-200MHz Intel® Pentium® processor
128 RAM/1.6GB HDD
Internet ready/28.8 voice modem
Speaker-phone/8x CD-ROM drive
3D graphics & sound/MPEG card
And much more ... Yours to ENJOY



Designed for optimal

communication,

productivity,

& pleasure.

Get MITAC's *Pursuit* and delve into endless enjoyment.

Meet *Discovery*, MITAC's navigator. Providing instant ease-of-use, this fun and eye-catching Windows® 95 -enhancer makes computing a lot easier and more fun for everyone.

Scan and edit text and graphics in a flash. Move data from your notebook, PDA or digital camera to your *Pursuit* at warp speed, easily. Or use *Pursuit* as your phone, fax, Internet/e-mail machine, and even as your stereo & video player.

Enhance your skills with super communication software. Entertain yourself with exciting games. Or pursue many other computing thrills at a speedy 166MHz Intel® Pentium® processor and awesome 3D graphics & sound.

Get a MITAC *Pursuit* today and enjoy.

Ideal For The Home & Office

COMDEX Fall '96
Visit Mitac at Hall S-2, L2435



The Intel Inside Logo and Pentium are registered trademarks of Intel Corporation.
Specifications are subject to change without notice or obligation.

■ MITAC INTERNATIONAL CORP. Lin Kuo Office - Tel:886(3)3289000 Fax:886(3)3289028 ■ MITAC JAPAN CORP. Tel:81(3)5420-2822 Fax:81(3)5420-4586 ■ MITAC AUSTRALASIA PTY. LTD. Tel:61(3)9540-0555 Fax:61(3)9540-0588 ■ MITAC DE MEXICO, SA DE CV - Tel:52-5-2603399 Fax:52-5-2600616 ■ MITAC PACIFIC (H.K.) LTD. Tel:(852) 2528-6782 Fax: (852)2861-3754 ■ BRUNEI - OA System Computer Tel:673-2-244640 ■ EGYPT - EGOS Tel:202-4548800 ■ INDONESIA - P.T. Inforindo Naditama Tel:62-21-3913633 Fax:62-21-3842662 ■ ISRAEL - Milon Tel:972-3-9255255 Fax:972-3-9255222 ■ KUWAIT - ZAID AL-KAZEMI SONS Tel:965-2451680 ■ MALAYSIA - Alpha Data SDN BHD Tel:60-3-7546666 Fax:60-3-7545555 ■ PHILIPPINES - Integrated Computer Systems INC. Tel:632-722-4111 Fax:632-721-2113 ■ SAUDI ARABIA - NAHIL Tel:1-4645373 Fax:1-4645365 ■ SOUTH AFRICA - AZ Computer Tel:27-11-3141219 Fax:27-11-3141656 ■ THAILAND - IFEC Tel:662-559-2419 Fax:662-559-2418 ■ TUNISIA - Standard Sharing Software Tel:216-1-796000 ■ TURKEY - Albim Tel:0-216-3493351 Fax:0-216-3477069 E-mail: market@smplink.mic.com.tw (URL): http://mitac.mic.com.tw

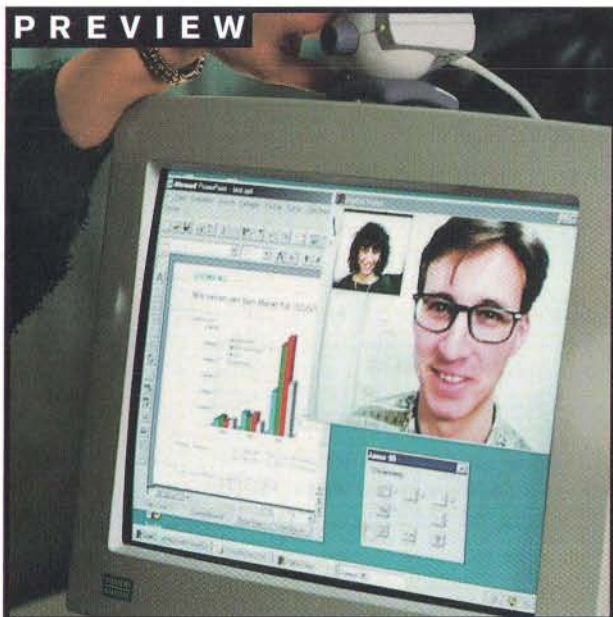
Circle 733 on Inquiry Card (RESELLERS: 734).

What's New

Hardware

ISDN communications kit, fiber modem, Arabic OCR software, simulation-building program, plus more.

PREVIEW



IView

Price: DM 1990

Circle 986
on Inquiry Card.

Siemens

Munich, Germany
+49 722 35305
fax: +49 722 33668

ISDN-Based Total Comm Package

IView is a comprehensive ISDN communications solution. It features videoconferencing software, a digital camera, an answering machine, and application-sharing capability, plus it supports MPEG playback in hardware. IView includes an external handset that performs like an ISDN phone and contains a sound card.

The ISDN PCI card offers standard H.320 videoconferencing, deploying two B channels transmitting at 15 frames per second. The system can also operate with ISDN videoconferencing systems that use only one B channel. In conference with another IView board, you not only can share applications but can also simultaneously transfer files. In this situation the system uses one B channel for audio transmission and the other one for video and data. It is also possible to connect a camcorder or a video recorder via a second camera socket.

The system supports Eurofile transfer, fax group 3 and 4 protocols, V.110-compliant bit rate adaptation, as well as CAPI version 1.1. Support for CAPI 2.0., Siemens says, will come later in the year.

— Rainer Mauth



Mobile Computing

Upgrade Processor for Compaq Notebooks

WITH THE H&P 586 UPGRADE MODULE users can upgrade their Compaq Elite and Contura notebooks to Pentium performance by replacing the processor and socket on the main board. The H&P 586 upgrades 486 processors to 100-MHz or 133-MHz clock speeds. Price: DM 598. Hantz & Partner, Gundelfingen, Germany, +49 761 592100; fax: +49 761 585228; 100431.2606@compuserve.com.

Circle 987 on Inquiry Card.

Add Floppy Drive to Psion

CYCLONE IS AN EXTERNAL 3½-INCH floppy drive for the Psion Series 3a and Workabout computers. It appears as drive C to all Psion applications, works with all software that adheres to Psion standards, and includes the File Manager software. The drive is powered by 5 AA cells or mains power. Price: £170. Purple Software, London, +44 171 3877777; purplesoft@cix.compulink.co.uk.

Circle 988 on Inquiry Card.



German Pilot 5000

A GERMAN VERSION OF THE PILOT 5000, a pocket-size hand-held computer, comes with 512 KB of memory and can be upgraded to 1 MB to hold 10,000 address entries. An information management system communicates with



your Windows PC via a docking station and HotSync software. Price: DM 780. US Robotics, Paris-la-Defense, France, +33 141974600; fax: +33 149070303; <http://www.usr.com/palm>. Circle 989 on Inquiry Card.

Image Processing

Image Acquisition Board

ELF, A PCI-BASED IMAGE ACQUISITION system, can capture data from RGB, S-video, composite, or

CORRECTION

Two photographs in the September What's New section were improperly positioned. The photo of the Gold Card Multi-Function PC Card (page 40IS 19) should have gone with the first item in the Communications section (page 40IS 20). The photo of the MaxIt removable drive should have accompanied the first item in the Storage section (page 40IS 20) instead of the photo that appeared there.

monochrome video sources. The board supports trigger input, strobe control, and other external devices. It also incorporates real-time scaling, panning, scrolling, and zooming. Elf comes either as a bus-mastering DMA board that works with any PCI graphics card or as a combined VGA graphics and image acquisition board.

Price: Call company. Active Imaging, Maidenhead, U.K., +44 1628 415444; fax: +44 1628 415400; info@datacell.co.uk; http://www.imaging.co.uk.
Circle 990 on Inquiry Card.

Desktops

200-MHz Pentium PCs

SIEMENS' SCENIC PRO C5 AND PRO M5 series of desktop and mini-tower PCs now comes with 200-MHz Pentium processors. These faster models are aimed at people running professional multimedia applications as well as at SOHO users. All the systems deploy SNI's Quickfax software, which enables users to receive faxes without the PC being on. *Price: Starts at DM 3950. Siemens Nixdorf, Augsburg,*



Germany, +49 821 804 3680; http://www.sni.de.
Circle 996 on Inquiry Card.

Networking

Fiber Modem

FOM-E1/T1, A FIBER MODEM, CONVERTS electrical E1 or T1 signals into

optical signals. With FOM-E1/T1 you can deploy E1/T1 equipment while you switch your cabling to fiber optics. The system works over a distance of 50 kilometers. It comes as a standard E1 add-in board.

Price: Call company. RAD Data Communications, Tel Aviv, Israel, +972 3 645 8107; fax: +972 3 649 8250; ilan@radmail.rad.co.il; http://www.rad.co.il.
Circle 991 on Inquiry Card.

SmartView Controls Several Servers

SMARTVIEW LETS A POOL OF SERVERS share keyboard, video, and mouse. The device supports any mix of AT and PS/2 keyboards and PS/2 and RS-232 mice. An autoboot function reboots shut-down servers



automatically. The devices support two or four servers and can be cascaded to form a video-switching network. Additional features include a security function (password for access), screen-saver between active ports.

Price: Starts at £295. Adder Technology, Cambridge, U.K., +44 1223 420912; fax: +44 1223 423495.

Circle 993 on Inquiry Card.

Remote Access Router Supports CAPI

THE BIANCA/BRICK REMOTE ACCESS routers now come with a dual-mode interface that supports CAPI 1.1 and CAPI 2.0. The CAPI drivers run under all flavors of Windows, OS/2, and Unix and can access all CAPI-compliant applications.

Price: Call company. BinTec Communications, Nürnberg, Germany, +49 911 9673 162; fax: +49 911 9673 195;

awild@bintec.de; http://www.bintec.com.
Circle 992 on Inquiry Card.

10Base-T Hubs with Video Display

D-LINK'S DE-1824 SERIES OF STACKABLE 10Base-T hubs offers video display of statistics, diagnostic information, and segmentation of a network from a management station. Up to eight hubs can be linked, with seven client hubs sharing an SNMP management agent of a master hub. Each hub comes with 24 twisted-pair ports in one low-profile, rack-mountable case. The RJ-45 ports support both UTP and STP cable, while a recessed AUI slot is provided for flexible connection to the thin coax, thick coax, and fiber cable through any standard-size transceiver.

Price: Call company. D-Link Corp., Taipei, Taiwan, +886 2 916 1600; fax: +886 2 914 6299.

Circle 994 on Inquiry Card.

ATM Upgrade for LANs

FIBRONICS' XM501 ATM ACCESS CARD is a simple way to upgrade your current LAN to asynchronous transfer mode via the Fibronics GigaHub. The XM501 connects the GigaHub backplane to ATM networks, forming large backbone systems. It features a bridge/switch engine that provides a backplane-to-ATM gateway using a 155-Mbps OC3 connection. The XM501 preserves all network investments and, Fibronics says, ensures interoperability between switched Ethernet and Fast Ethernet stations over an ATM backbone. The Access Card features LAN Emulation Server service, allowing it to operate in ATM networks with an ATM switch that does not provide such service. The XM501 supports permanent virtual circuits, switched virtual circuits, and UNI V3.1 signaling.

Price: Call company. Fibronics Ltd., Haifa, Israel, +972 4 8313 313; fax: +972 4 8550 550; sales@fibronics.co.il;

http://www.fibronics.co.il.
Circle 995 on Inquiry Card.

CPU Boards

Industrial 486 Board

THE PCA-6144V IS A 486DX2/DX4 CPU card for industrial use. It has a



local-bus VGA controller with Windows accelerator and 1 MB of display memory, an enhanced IDE interface, a floppy controller, two high-speed buffered serial ports, and a 63-level watchdog timer.

Price: Call company. Integrated Measurement Systems Ltd., Southampton, U.K., +44 1703 771143.
Circle 997 on Inquiry Card.

Storage

A Dozen Gigabytes

THE N3000 SERIES OF NETWORK FILE servers can store up to 12.9 GB. They support RAID functionality, and you can daisy chain two devices via SCSI. You can attach them to any Ethernet LAN without shutting down the network.

Price: Starts at DM 14,000. Xyratex, Havant, Hants, U.K., +44 1705 486363; http://xyratex.com.
Circle 1001 on Inquiry Card.



VISUAL BASIC 3 ADD-ONS

Comms - Async

Fax Plus for Win	£175
FaxMan SDK	£390

Comms - Network

Distinct TCP/IP Visual Internet	£265
dsSocket 1.25 Intro	£65

Database

ADE/VBX	£350
Smithware VBX for Btrieve	£180
VB/ISAM MU for Win 16-bit	£145

Graphics - Charting

Chart FX 3.0 (16-bit only)	£210
Charting Tools for Win - VB	£180
Real-Time Graphics Tools - VB	£300
VBGraphix	£270

Graphics - Image Files

Image SDK Plus/VBX 2.0	£250
ImageKnife/VBX Std 2.0	£200
ImageMan/VBX 5.0	£230

Multi-Function

Borland Visual Solutions Pack	£59
Designer Widgets 2.0	£99
Muscle (Win)	£125
VBLib 1.0	£130
VBTools 4.0	£115
Visual Developer's Suite (16 bit)	£216
WinWidgets/VBX	£160

PROGRAMMING TOOLS

Ada	Assemblers
Basic	C/C++
Comms	Cross Dev
Custom Controls	Database
Debuggers	Delphi
Editors	Fortran
Graphics	GUI
Linkers/Locaters	Lisp
Modula-2	Multi-tasking
Pascal	Prolog
Smalltalk	SQL
Version Control	Visual Programming
Windows	Xbase

We stock many items for which there is no space in these advertisements.

DELPHI

Delphi Desktop 2	£245
Delphi Developer 2	£390
Delphi Client/Server Suite 2	£1260
ABC for Delphi 1.0b	£99
Aply Dev Suite for NetWare	£195
Asynch Pro 2.0 for Delphi	£135
Borland RAD Pack for Delphi	£125
Charting Tools for Win - Delphi	£180
Component Create	£55
Conversion Assistant Database	£198
Eschalon Power Controls	£98
Helping Hand for Delphi	£150
HyperTERP/Delphi	£120
ImageLib Pro 16-bit	£109
InfoPower	£179
InnoView MultiLanguage	£125
KingCalendar Pro	£65
List & Labels for Delphi 3.5	£295
Mobius Draw Kit	£99
OCX Expert	£195
Orpheus	£135
Pumpkin Project Organiser	£15
Real-Time Graphics Tools	£360
Transform: Component Expert	£125
VisualPROS 1.1	£119
WinG Sprite Kit	£99

LOW PRICES

MICROSOFT & BORLAND PRODUCTS

MS Fortran PowerStation Std 4	£485
MS Visual Basic Std 4.0	£78
MS Visual Basic Prof 4.0	£365
Microsoft Visual C++ 4.0	£399
Borland C++ 5.0	£245
Delphi Desktop 2	£245
Delphi Developer 2	£390
Paradox for Win95 7.0	£92
Turbo C++ for Win 4.5	£68
Visual dBASE 5.5	£260

WITH FULL TECHNICAL SUPPORT

ASSEMBLERS

Borland Turbo Assembler 4.0	£66
MS Macro Assembler 6.11	£114
Phar Lap TNT DOS Ext SDK 8	£460

Sundry Components

CADControl	£365
d-Barcode VBX/DLL	£94
VB/Magic Controls	£120
Visual CAD Dev Kit	£520

Sundry Controls

3D Graphics Tools 4.0	£130
EDI-VBX 1.0	£705
Gantt/VBX	£195
MediaKnife/VBX	£290
VBX Artist	£240
Visual Instrument Panel Cntrl	£150
VideoSoft VSView/VBX	£105

Text Editor Controls

TX Text-Control Standard	£205
--------------------------	------

Tools

JET Inspector 2.0	£475
SpyWorks-VB 2.1	£100
TMS Tools 1.1	£99
VBAssist 3.5	£140
VB/DLL 2.05	£165
VERSIONS/VB 1.1	£135

C & C++ WINDOWS

Comms

Asynch Pro for Win 2.1	£135
COMM-DRV/LIB 16.0	£105
Fax C++ SDK for Win16/95	£770
Greenleaf CommLib 5.2	£235

Compression

Crusher! Win DLL w/Source	£235
Greenleaf ArchiveLib 2.0	£210
PKWare Data Comp Lib for Win	£175
TCOMP/Multi-Platform 2.12	£105

Database

CodeBase 6.0	£270
CXBase Pro	£500
DBTools.h++ for ODBC	£1250
DISAM96 for DOS/Win	£715
Greenleaf Database Library 4.0	£180
List & Labels for Win (Pro)	£410
POET Personal SDK 4.0	£649
ProtoGen+ Client/Server Win	£1470
Raima DBM Engine+EADS 4.0	£740
Velocis + EADS (Offer)	£250
Visual SQL	£990

Graphics - Charting

Charting Tools for Win 2.0	£180
Essential Chart for Win	£275
GraphiC/Win 7.0	£360
Graphics Server 4.0	£245
Real-Time Graphics Tools	£360

Graphics - Image Files

AccuSoft Image Lib/Win 5.0	£610
Ad Oculis (Image Analysis) 2.0	£325
Image SDK Plus for NT	£505
ImageKnife Pro 2.0	£280
ImageMan DLL 32 & 16-bit 5.0	£620
LEADTOOLS Win32 Pro 6.0	£715

C & C++ FOR DOS

Comms

Essential Comm 5.0	£235
MagnaComm/DOS	£215
SilverComm "C" Asynch 4.02	£195

Database

c-tree Plus 6.5A	£565
SoftFocus Btree/ISAM	£75

Graphics & GUI

3D-Ware Pro	£99
Fastgraph 4.0 (Ted Gruber)	£195
GX Graphics 3.0	£155
MetaWINDOW-DOS 5.0	£215
Zinc Engine & DOS Key 4.1	£634

Maths & Scientific

C/Math Toolchest & Grafix	£45
Huge Virtual Array & NAT 3.0	£215
Science, Eng & Graphics Tools	£115

Screen

C/Windows Toolchest	£45
Greenleaf Datawindows 3.0	£225
TCXL UI for DOS/Win 6.2	£135

General & Systems Libraries

GX Sounds	£165
MTASK	£215
TTSR Ram Res Dev Sys 2.03	£100

Tools

C-DOC Pro 6.0	£240
C-Vision for C/C++ 4.0	£145
CodeCheck (Professional)	£475
PC-Lint for C/C++ 7.0	£135

GREY MATTER

Prig Meadine, Ashburton, Devon TQ13 7DF

Prices do not include VAT or other local taxes but do include delivery in mainland UK. Please check prices at time of order as ads are prepared some weeks before publication.

This page lists some of our products - call us for a complete price list.

ORDER BY PHONE WITH YOUR CREDIT CARD

(01364) 654100

FAX: (01364) 654200

BASIC LANGUAGE

PowerBASIC Pro (Win&DOS)	£210
PowerBASIC DLL Compiler	£106
XBasic Pro (Win32)	£199

Graphics & GUI

3d Graphics Tools 5 (32-bit C)	£230
ProtoGen+ Pro for Win32/16	£415
WinGKS	£575
WinMaker Pro 6.0	£725
zApp	£575
Zinc Engine & Win16/32 Key	£634

Maths & Stats

IMSL C Numerical Libraries	£495
IMSL Math Module for C++	£495
Math.h++ 5.1.3	£495
Money.h++	£1075

Sundry Components

C++ Bunch Components	£415
HeapAgent 16 & 32-bit Combo	£655
TG-CAD Prof 6.0	£770
Tools.h++ 7.0	£340
WinWidgets++	£240

Tools

CC-RIDER for Win16	£250
KPWin++	£625
New! Solo Intro	£295
SOMobjects Dev Toolkit	£200
Visual Parse++	£289

VISUAL BASIC 4

Visual Basic Enterprise 4.0	£755
Visual Basic Professional 4.0	£365
Visual Basic Standard 4.0	£78

3d Graphics Tools 5 (32bit VB4)	£149
Aply Dev Suite for NetWare	£195
AutoCoder	£55
BetterState Pro w/VB CodeGen	£249
ButtonMaker	£75
ClassAction (VB4)	£110
ClassAssist (inc Oblets)	£175
CodeBank (VB3/4)	£88
Code Complete	£175
Crescent Internet ToolPak 2.0	£135
Designer Widgets 2.0	£99
EnQuery 2.0 (VB4)	£199
ERwin/Desktop for VB4	£399
GeeWiz 2.0	£75
Helping Hand for VB	£150
Into Code (VB4)	£55
List & Labels for VB3/4 3.5	£295
PowerPak Enterprise for VB4	£925
PowerPak Professional for VB4	£505
SplashWizard	£75
Spyworks - Prof 4.0 (inc Sub)	£225
Tear Off Menus for VB4	£115
VB AppFramework	£159
VB Assist 4	£130
VB Compress Pro 4.0	£98
VB Language Manager Pro 3.0	£132
Vision StoryBoard 4.0 (VB4)	£175
Visual Bridge (Access -> VB4)	£89
Visual Expert Developer	£250
XREF 2.0	£95

VISUAL BASIC FOR DOS

MS Visual Basic for DOS Std	£100
MS Visual Basic for DOS Prof	£240
db/Lib Prof 3.0	£195
Graphics Workshop	£105
PDQComm 2.62	£85
ProBas 7.1	£210
QuickPak Pro 4.19	£145

News & Views

Borland C++ Development Suite with Design Tools 5.0

New Variant Includes
Together/C++, Innovative Two-Way
OO Analysis & Design Tool

Borland & Object International have seamlessly integrated Together/C++ into the Borland C++ IDE, producing the first CASE tool that is as easy to use as an editor.

Together/C++ lets you design & code at the same time - the object model is simply an alternative view of the source code. Change the object model and the source is updated - edit the source and the object model updates itself!

This is possible because the design information is stored in the source code - there is no repository to slow you down and get out of sync! This also makes it trivial to reverse engineer existing apps, and means that you can use existing version control systems. Together/C++ consists of 3 tools:

- **Object Model Editor** shows classes, attributes, etc graphically. Use Coad, OMT or Unified 0.8 notation. Many options for viewing, browsing & filtering classes
- **Scenario View Editor** models class dynamics using Coad scenario views (time-ordered sequence of object interactions). Identify use-cases and model each one with a scenario
- **Information Export** engine produces documentation directly from the source. Outputs HTML, RTF or HLP. Templates included, or define your own

This is the first time that an OO analysis & design tool has become an integral part of the IDE - call us for full details & pricing.

Crystal Reports 5.0

Major New Release of the Popular
Reporting Tool

The latest release of Crystal Reports adds new flexibility to the Designer & Engine that let you create new types of report. New features include:

- **New Report Types** include sub-reports, multiple section reports, form reports, mail merge reports, conditional reports, query reports and Web-Ready reports
- **New Report Designer** with drawing-style interface treats all items in a report (text, fields, sub-reports, graphs, etc) as objects that can be placed anywhere and formatted with the Format Editor
- **New Distribution Options** include HTML, with enhancements to Word & Excel. Distribute reports via e-mail, Notes or Exchange
- **New Data Sources** (Professional only) include Informix, MS SMS, MS Exchange, MS Internet Server, MS Visual FoxPro, Sybase SQL Anywhere & Web Server Activity Logs (NCSA format)

Crystal Reports 5 must now be the most comprehensive reporting tool for developers. Call for details.

C++ COMPILERS

Borland C++ 5.0	£245
Borland C++ Dev Suite 5.0	£337
BC++ Dev Suite + Des Tools	CALL
MS Visual C++ Subscription 4.1	£399
MS Visual C++ Standard 4.0	£59
Optima++ Developer Intro	£139
Salford C/C++ Win Dev	£395
Symantec C++ 7.2	£375
Turbo C++ for Win 4.5	£68
VisualAge for C++ 3.5 w/Docs	£326
Watcom C/C++ 10.6 Intro	£145
High C/C++ for Ext-DOS/Win	£620
Salford C/C++ DOS Dev	£195
Turbo C++ 3.0	£66

OBEBRON

Oberon Direct-to-COM	£1700
Oberon/F	£315
Oberon/F Dev Bundle	£569
Ofront (Oberon-to-C Translator)	£715
Oberon/F Arbitrary Precision Lib	£55
Oberon/F Source Code Analyser	£55
Oberon/F Statistical Profiler	£165
Logitech Modula-2 Dev Sys 4	£560
Stony Brook Prof Modula-2 3.0	£445

Benelux

Gerry Westerhof
Phone: 31 72 509 1855 Fax: 31 72 509 1145

Bulgaria

Daniel Christov
Phone/Fax: 359 2 974 3557

France

Eric Le Quinio
Phone: 33 1 49 77 03 06 Fax: 33 1 43 76 74 29

Germany, Austria, Switzerland

Wolfgang Brezina
Phone: 49 89 525 847 Fax: 49 89 529 850

Greece

Maria Hadjioannou
Phone: 30 61 620384 Fax: 30 61 272072

Hungary

Imre Szabo
Phone: 36 76 488888 Fax: 36 76 488889

Ireland

Ian Bangham
Phone: 353 1 280 7133 Fax: 353 1 280 7157

Italy

Enrico Campia
Phone: 39 11 8127656 Fax: 39 11 8994422

Middle East

Zafar Inamdar
Phone: 971 4 666788 Fax: 971 4 621149

Poland

Wlodek Binczyk
Phone/Fax: 48 2 625 2275

Portugal

Manuel Neves
Phone: 351 1 3479301 Fax: 351 1 3475127

Scandinavia

Gunnar Sandberg
Phone: 45 3314 2226 Fax: 45 3314 2218
or Lauge Dehn
Phone: 45 86 223188 Fax: 45 86 228159

South Africa

Cape Town: J Trisos
Phone: 27 21 24 4094 Fax: 27 21 24 8681
Durban: T Tyson
Tel: 27 31 2027303 Fax: 27 31 2027307
Johannesburg: M Kendrick
Tel: 27 11 8804988 Fax: 27 11 4428327

Spain

Barcelona: Javier Casellas
Phone/Fax: 34 3 2380342
Madrid: Eduardo Montojo
Phone/Fax: 34 1 5716685
or Henri Misrahi Phone: 34 1 7337346 Fax: 34 1 7338970

Turkey

Cengiz Eren
Phone: 90 216 345 3473 Fax: 90 216 346 2464

United Kingdom

Peter Gregson
Phone: 44 1 61 430 3423 Fax: 44 1 61 494 6976
or John Luker
Phone: 44 1 258 821114 Fax: 44 1 258 821115

If there is no BYTE representative listed above for your country, please contact:

BYTE Subscriber Services:

PO Box 72, Galway, Ireland.
Fax: +1 353 91 752793.
Phone: +1 353 91 752792.



A Division of The McGraw-Hill Companies

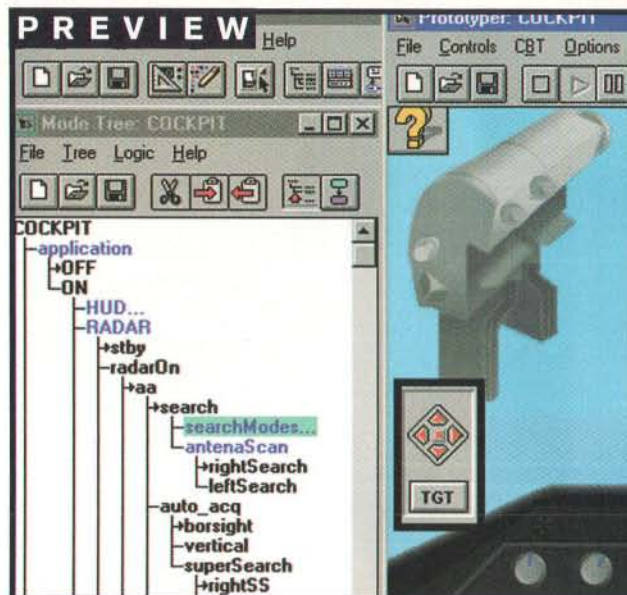
SOFTWARE

Development Tools

Magic System Releases Win 95 and NT Versions

MAGIC SOFTWARE ENTERPRISES HAS launched the first Windows 95 and NT version of its Magic rapid application development tool. The faster

32-bit version 7 of the table-driven, code-free programming tool has several new features, including a built-in Web link for creating Internet applications. Magic 7 has an increased emphasis on component reusability and also supports OLE 2.0. There are improved GUI functions and performance enhancements for the Magic client and server architecture. Form templates can be saved as Magic Form Templates and reused. Support for



RAPID 3.5

Price: \$6000

Circle 1002

on Inquiry Card.

Emultek

Jerusalem, Israel
+972 2 870 770

fax: +972 2 870 773

100274.2054@compuserve.com

http://www.emultek.com

New Version of RAPID Visual Programming Tool

Emultek's 32-bit RAPID 3.5 is the latest version of the company's tool that enables nonprogrammers to quickly create interactive simulations of systems ranging from cellular telephones to airplane cockpits. No knowledge of computer code is needed to create simulations. Just use the Object Editor to pick objects from a library that includes switches, dials, displays, buttons, and a host of other options. The Logic Editor then links the objects to create a working simulation.

Version 3.5 has several innovative features, including the capability to make the RAPID application you've created into a user-defined object, which can then be encapsulated in other simulations. If you want to develop training tools, it's easy to link RAPID simulations to multimedia applications built with all leading authoring tools. An Internet plug-in will be released shortly, Emultek says.

— Tania Hershman

BYTE Proudly Announces its First Annual Awards Program to Recognize the Best Products of Europe...

Best of SYSTEMS 96

BYTE magazine will honor **EUROPE'S BEST NEW PRODUCTS** at SYSTEMS 96 in Munich. If your company plans to launch a new product that will be exhibited at SYSTEMS 96, you are encouraged to send product information to BYTE's editors and enter the Best of SYSTEMS 96 awards competition. The judging will take place during the trade fair in Munich, Germany (21-25 October).

When evaluating eligible products, BYTE editors look for innovative new products that show potential influence on business computing worldwide, and have a strong impact on show attendees.*

BYTE's Team of Editors will be Evaluating New Products in the Following Categories:

**Best Business
Management
Solution**

**Best
Communication
Product**

**Best Industrial
Application**

**Best Corporate
Networking Product**

**Best Multimedia
Product**

**Best Internet
Product**

**Best Desktop
and Server
System**

If you'd like your product to be considered for these awards, please send us your product press releases (not products) by October 4, 1996. Be sure to include your stand number and exhibit hall.

Send to: Rainer Mauth, BYTE European Editor
The McGraw-Hill Companies
BYTE Magazine
Emil-von-Behring-Strasse 2, D-60439 Frankfurt, Germany
Tel: + 49 69 5801-123 Fax: + 49 69 5801-145
rmauth@mcgraw-hill.com

Or submit your entry via the Internet at <http://www.byte.com>
Click on the VPR icon for details.

*Nominated products must be announced within 30 days of SYSTEMS 96 and must be on display at the show.

BYTE editors will view products personally at Systems 96 and determine nominees for the awards.

Winners will be notified in advance of the formal announcement which will be made at the show.



The Global Authority for Computing Technology

A Division of The McGraw-Hill Companies



MOVING?

To change your subscription mailing address, please complete the form below and send it to:

BYTE

BYTE Magazine
Subscriber Services
PO Box 555
Hightstown NJ 08520 USA

Fax: 609-426-7087
Phone (9 a.m. to 8 p.m., Eastern Time
Monday through Friday): 609-426-7676

Current/Old Address:

Account Number

Name

Company

Address

City/State/Zip

PLACE MAILING
LABEL HERE

New Address:

Name

Company

Address

City/State/Zip

Please allow up to 8 weeks for this change to become effective.

A Division of The McGraw-Hill Companies



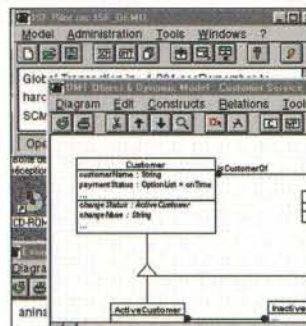
International Software

multilingual applications has also been enhanced.

Price: \$6000. Magic Software Enterprises, Or-Yehuda, Israel, +972-3 538-9400; fax: 972-3 538-9402; beni@mse.mhs.compuserve.com; <http://www.magic.co.il>. Circle 1003 on Inquiry Card.

Repository-Based CASE Tool

THE INTELLIGENT SOFTWARE FACTORY (ISF), an integrated suite of object-oriented CASE tools, is built on a shared repository and allows for complete life-cycle management of development projects. It includes event tracing, modeling of nested states and events, and documen-



tation and diagnosis features. With ISF, programmers can capitalize on multiple CASE methods and iterative development.

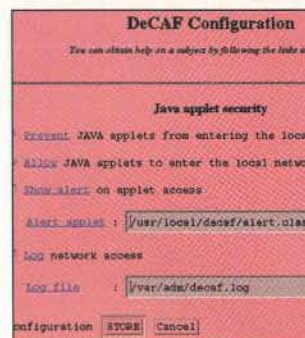
Price: Call company. Reich Technologies, Paris Cedex, France, +33 98 46 61 32; fax: +33 98 44 7772; 101473.1573@compuserve.com.

Circle 1004 on Inquiry Card.

Internet

DeCaf Protects Against Foreign Java Applets

DeCAF IS AN HTTP PROXY SERVER THAT sits between a corporate LAN and the Internet and acts as a special relay that scrutinizes all inbound and outbound Web traffic. The software provides an extra measure of security. When it receives a



request from a Java applet, it blocks this request and warns the network manager about what's happening. The program also logs all requests and builds audit trails.

Price: Call company. LeReseau Netwerksystemen, Middelstum, The Netherlands, +31 595 552431; fax: +31 595 551279; info@reseau.nl; <http://www.reseau.nl>.

Circle 1006 on Inquiry Card.

Now You Can Put PowerPoint Shows on the Internet

POINTPLUS, FROM NET-SCENE, ENABLES PowerPoint users with no HTML skills to publish PowerPoint presentations on the Internet. Net-Scene's compression technology converts existing PowerPoint presentations, from bullet-point slides to presentations with sound, for on-line viewing. The PointPlus plug-in viewer lets you see the presentation within the Netscape Navigator or Chameleon Web surfer window. PointPlus is the first in a series of low-end and midrange Internet-based presentation tools for other graphics-authoring programs. You can download a free copy of PointPlus's viewer and sample presentations from the Net-Scene Web site. PointPlus requires Windows 95 or Windows NT 3.51 and PowerPoint 4.0 or higher. The plug-in works under Windows 3.1 or higher, Windows 95, and Windows NT 3.51.

Price: Call company. Net-Scene, Herzliya, Israel, +972 9 558 260; fax: +972 9 558 262; info@net-scene.co.il; <http://www.net-scene.co.il>. Circle 1078 on Inquiry Card.

Networking

Software-License Control

INTEGRA-SLM DISTRIBUTES AND CONTROLS software licenses in heterogeneous networks. In case all



licensed copies of an application are in use, the program puts further requests for that software on hold and then assigns the next free license. The program also includes virus detection and utilization statistics. Integra-SLM runs on NetWare, Windows NT, Sinix, Unix, Banyan Vines, or LAN Manager servers.

Price: DM 20 per client. CSD Software, Starnberg, Germany, +49 8151 3690; fax: +49 8151 36988; StephanH@csdsoft.de.

Circle 1010 on Inquiry Card.

Event Log Manager for NT

ENABLING WINDOWS NT NETWORK administrators to detect network, system, and application issues as they occur, SeNtry Event Log Manager 1.6 monitors server status, network traffic, and unauthorized access attempts. The system col-



lects events in an ODBC-compliant database and integrates with HP's OpenView and NetView network management platforms.

Price: £149 per server. Serverware Group, London, +44 171 419 2020; fax: +44 171 419 2030.

Circle 1011 on Inquiry Card.

Easier Access to E-mail While You're on the Road

WITH HT MAIL, CHECKING E-MAIL FROM a remote site becomes easier and cheaper because this mailbox server software provides access to the post office of your LAN over the Internet. You launch a standard Web browser, tap in the corporate URL, and key in a password to access the e-mail system in your office. You get full access to personal and shared folders as well as the complete LAN address book.

HT Mail keeps your mail in sync while you're on the road. It doesn't matter if you download e-mail or read it on-line; when you are back in the office, you will find the com-



plete e-mail conversation filed on your LAN. HT Mail links to an external Web server on your LAN but it can be used within your corporate intranet. The software works with Microsoft Exchange, MS Mail, cc:Mail, and other SMTP or MAPI messaging systems. Via MAPI you can even access Lotus Notes 4.0. Supported server platforms are Windows NT and Unix.

Price: Starts at £195 (10-user license). Elonex, London, +44 181 4524444; fax: +44 181 4526422; http://www.elonex.co.uk.
Circle 1012 on Inquiry Card.



For printers and plotters with MIO - port



INTERCON® - PRINTSERVER

for Ethernet and Token Ring networks

SNMP - Support
HTML - Administration
NOVELL (IPX)
UNIX (TCP/IP)
WINDOWS (TCP/IP)
APPLE (Ether/Talk)



Ask for more INTERCON products!

Sunderweg 4
D-33649 Bielefeld, Germany

Phone: +49/521/94226-0
Fax: +49/521/444049

Internet: http://www.seh.de
E-Mail: info@seh.de
CS-Id.: 100742,1452

SEH
Computertechnik GmbH

GET IT DONE WITH OEW FOR JAVA™



<http://www.isg.de/OEW/JAVA>

isg Innovative Software GmbH Germany © +49 69 236929 Fax +49 69 236930

Subscription Problems?

If you have a problem with your BYTE subscription, let us know! For best service, provide a brief description of the problem and a copy of a recent magazine mailing label (if available). If your label is unavailable, just give us your subscription account number along with your name, address, and zip code where your BYTE subscription is currently being sent. If you have a change of address, be sure to provide both your old and new addresses. If the problem involves a payment, be sure to include copies of your cancelled check (both sides) or your credit card statement. Please include a "business hours" phone number if possible. Send to:



**BYTE Magazine
Subscriber Service
PO Box 555
Hightstown, NJ 08520**

Fax: 609-426-7087

**Phone: (9 a.m. to 8 p.m. Eastern Time,
Mon. - Fri.) 800-232-2983 (U.S.), or
609-426-7676**



A Division of The McGraw-Hill Companies



INTERCON® - PRINTSERVER

ETHERNET

NOVELL (IPX)

UNIX (TCP/IP)

LAN SERVER

LAN MANAGER

Apple EtherTalk

TOKEN RING



Call for information about all **INTERCON** products.

Sunderweg 4
D-33649 Bielefeld, Germany
Phone: +49 / 521 / 94226-0
Fax: +49 / 521 / 444049
Internet: <http://www.seh.de>
E-Mail: rci@sehgmh.bi.eunet.de
CompuServe Id: 100742,1452

SEH
Computertechnik GmbH

International Software

Business

Accounting System Supports Multiple Currencies

EXCHEQUER ENTERPRISE IS A NEW 32-bit accounting system for Windows 95 and Windows NT that supports multiple currencies and uses an Explorer-style tree to group and subgroup general ledger accounts. The system also handles open period accounting, which makes it possible to retrieve accounting bal-



ances and transactions from any previous period. A drill-down approach lets the user interrogate top-level as well as single stock information. The software supports multiuser environments.

Price: Call company. SBS Financial Systems, Derby, U.K., +44 1202 298008; fax: +44 1202 298001.
Circle 1009 on Inquiry Card.

Archiving

Archiving System with Full-Text Searching

EASY ARCHIVE 2000, AN ARCHIVING SYSTEM for Windows 3.1 and Windows 95, offers direct access to 20 archives with up to 2000 documents each. It provides version numbering and document history and automatically assigns alteration dates. Additionally, the system automatically inserts text into any archiving field, thus allowing full-text searching and editing.
Price: Call company. Easy,

Muehlheim/Ruhr, Germany,
+49 208 450160;
fax: +49 208 4501690;
easygmh@pop.du.gmd.com;
<http://www.easy.de>.
Circle 1008 on Inquiry Card.

Publishing

CD-ROM Mastering for the Mac

TOAST CD-ROM PRO 3 IS MASTERING software for the Macintosh that creates Mac or ISO 9660 volumes on-the-fly from files and folders. With this program, Mac volumes can be optimized and defragmented during recording.

Price: \$360. Astarte, Karlsruhe, Germany, +49 721 9855412; fax: +49 721 853862; 102404.3564@compuserve.com; <http://www.astarte.com>.
Circle 1005 on Inquiry Card.

OCR

OCR for Arabic

OMNIPAGE FOR ARABIC, AN OCR PROGRAM, turns printed Arabic pages into editable documents. This Windows 3.1 or 3.11 software recognizes all Arabic fonts regardless of style, size, or column format, Caere says. It also provides a bilingual interface of Arabic or English and comes bundled with the interna-



tional version of 12 Western and European languages.

Price: Call company. Caere, London, +44 171 2223200; fax: +44 171 2223202.
Circle 1007 on Inquiry Card.

12 Best Color Ink-Jets
JUNE 1998

BYTE

global authority for computing technology

ISDN Adapters: The Best for Business
VCDLive: Video over the Internet
Press Your Own CDs

ELECTRIC MONEY

How to Use It • How to Mint Your Own



Plus:
- Power Clusters
- Storage Breakthroughs

Remote Access Servers That Won't Quit

Readers' Choice Awards
Special Report:
NT Everywhere
Best Web Site Builder—
Microsoft or Netscape?

GROUP WAR!
WHY YOU CAN'T NIX NOTES... YET

Plus:
- Beyond GUIs
- Taiwanese Motherboards
- Bring USB to Market!

Ways to Store Hundreds of Gigabytes of Data

Thinnest, Brightest ThinkPad
Microsoft Powers Up
SQL Server 6.5
Netscape Navigator 3.0:
All but the Kitchen Sink

Run Your Business
on the Web



Plus:
- Integrating ATM
- Meet the Inventors of Future Computing

Global

Act Now
and
SAVE!

☐ Send me 12 issues for \$45 (USD) air mail delivery.

Save Time! Fax to: 1 353 91 752793

☐ My payment is enclosed

☐ Charge my: ☐ Visa ☐ Access/Eurocard/Mastercard ☐ American Express

Card No. _____ Exp. Date _____

Signature _____

Name _____

Address _____

City/Postal Code _____ Country _____

email Address _____

Please allow 8-10 weeks for delivery. If you pay with your credit card, you will be billed in your local currency (excluding Amex.).
A Publication of The McGraw-Hill Companies. Offer expires 6/30/97.

FQNB198

BYTE

Technical

Act Now
and
SAVE!

☐ Send me 12 issues for \$45 (USD) air mail delivery.

Save Time! Fax to: 1 353 91 752793

☐ My payment is enclosed

☐ Charge my: ☐ Visa ☐ Access/Eurocard/Mastercard ☐ American Express

Card No. _____ Exp. Date _____

Signature _____

Name _____

Address _____

City/Postal Code _____ Country _____

email Address _____

Please allow 8-10 weeks for delivery. If you pay with your credit card, you will be billed in your local currency (excluding Amex.).
A Publication of The McGraw-Hill Companies. Offer expires 6/30/97.

FQNB198

BYTE

Authority

Act Now
and
SAVE!

☐ Send me 12 issues for \$45 (USD) air mail delivery.

Save Time! Fax to: 1 353 91 752793

☐ My payment is enclosed

☐ Charge my: ☐ Visa ☐ Access/Eurocard/Mastercard ☐ American Express

Card No. _____ Exp. Date _____

Signature _____

Name _____

Address _____

City/Postal Code _____ Country _____

email Address _____

Please allow 8-10 weeks for delivery. If you pay with your credit card, you will be billed in your local currency (excluding Amex.).
A Publication of The McGraw-Hill Companies. Offer expires 6/30/97.

FQNB198

BYTE

Visit BYTE on the Web –
<http://www.byte.com>

PLACE
STAMP
HERE

BYTE

P.O. Box 72
Galway
IRELAND

Visit BYTE on the Web –
<http://www.byte.com>

PLACE
STAMP
HERE

BYTE

P.O. Box 72
Galway
IRELAND

Visit BYTE on the Web –
<http://www.byte.com>

PLACE
STAMP
HERE

BYTE

P.O. Box 72
Galway
IRELAND

*Act now
to save,
and
never
miss an
issue!*

BYTE

**The
Global
Authority
for Computing
Technology**

The eagerly awaited Lotus Domino serves up a goodly dose of Notes functionality to Web clients. By Steve Gillmor

Notes Opens Up to the Web

Domino, a.k.a. HTTP Services for Lotus Notes, gives Notes developers a powerful jumpstart in creating dynamic Web sites, and it offers unique interactive tools not yet available from other major players. Domino extends Notes' proprietary architecture onto the Web, serving Notes databases to browsers on-the-fly. It loads as a Notes 4.x server task, delivering both a traditional HTTP server and the Domino engine that interacts with the Notes document and object store.

While not eliminating the need for Notes clients, Domino does give Web browsers a great deal of Notes' functionality. Users can browse multiple views; create, edit, and delete documents; perform full-text searches; download binary files; read and send Notes mail; and post documents that trigger work-flow agents.

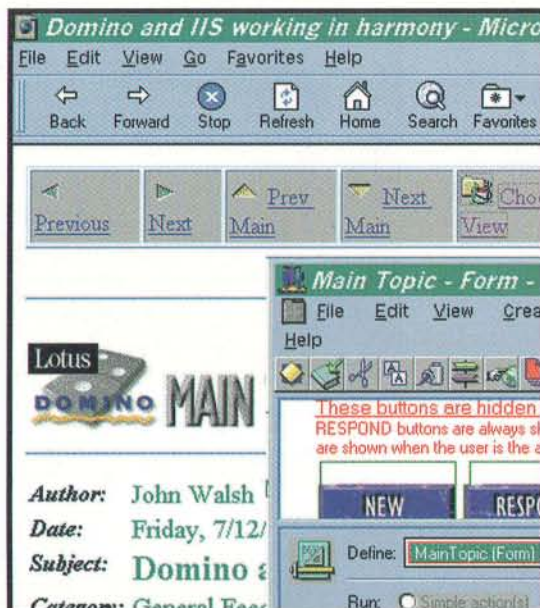
Installing Domino on our Windows NT server required updating the Notes Release 4.1 Public Address Book and registering Web users, adding them to a special Domino Users group. You can give

TECH FOCUS

Who's on Guard?

Domino creates new security exposures. Even with optional Secure Sockets Layer encryption, there's somewhat less security when accessing the Notes environment via a Web browser. With a standard Notes client, authentication requires an authorized Notes ID in addition to a password.

Domino globally exposes all Notes databases, requiring you to manually disable confidential databases from the Open Database dialog and Catalog lists. For now, Lotus suggests putting Domino databases on a separate server, using Notes replication to update and maintain communication between Internet and intranet.



Lotus Domino Free download

from <http://domino.lotus.com>
(requires Notes 4.x Server)

Lotus Development Corp.
Cambridge, MA

(800) 343-5414
(617) 577-8500

<http://www.lotus.com>

Circle 1049
on Inquiry Card.

Domino lets you customize Notes templates, databases, and forms for interactive HTTP serving.

group members access to databases at a variety of Notes security levels. You can also create an Anonymous entry in the Notes Access Control List to give access to unregistered users.

Domino allows Web developers to leverage Notes tools such as input validation and translation formulas, hiding and revealing information based on time-sensitive and user-identity criteria, and displaying threaded discussions that are automatically indexed for querying. The "gold" release we tested supplied several sample databases, including a registration application with several agents.

With Domino, you can detect the type of client and optimize the look of a database according to whether a Web browser or a Notes client is viewing it. Domino supports the insertion of Hypertext Markup Language (HTML) code, combining HTML and Notes data and pass-

ing it to the browser. You can use HTML pass-through code to process graphics, run Common Gateway Interface (CGI) scripts, and add URL links. Browsers don't sup-

RATINGS					
TECHNOLOGY	★	★	★	★	★
IMPLEMENTATION	★	★	★	★	★
PERFORMANCE	★	★	★	★	★

port the same rich server connections as Notes clients, so only server-based agents can use LotusScript scripting.

Domino will evolve as Web browsers acquire more capabilities. But even in its first release, this HTTP server add-in propels Notes to the head of its class. **B**

Steve Gillmor, of Southern Digital, Inc. (Charleston, SC), has extensive experience using and installing Notes. You can reach him at sgillmor@aol.com.

HDS's @workStation is a low-cost box for Web access, Java applets, and Windows. By Peter Wayner

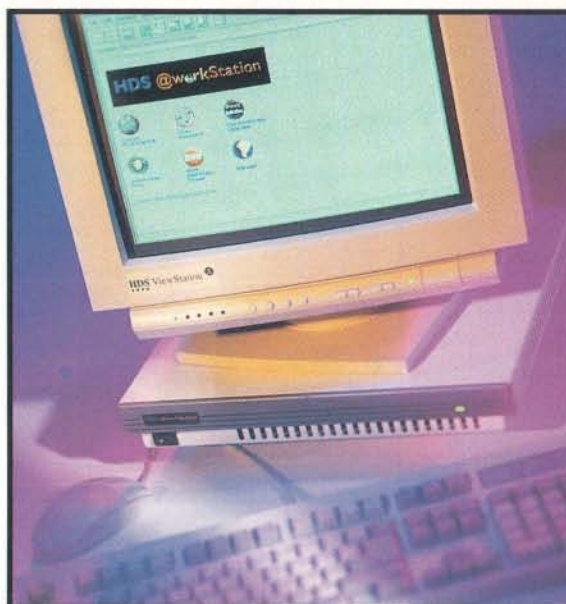
X Terminal + Browser + Java = Web PC

Many people are fascinated by the concept of a "network computer" that provides a low-cost way to get on the Net, browse the Web, and run Java applets. One of the first such machines to reach the market comes from HDS, which is selling an enhanced version of its X Window terminal called the @workStation. The system offers a surprisingly versatile way to give many users access to both the Web and Windows applications for as little as \$750 per seat.

HDS could jump into this new market so quickly because smart terminals that run X Window are a fixture in the Unix community. These are often diskless systems with a small amount of memory that simply display whatever the workstation tells them to. HDS took these functions and added three crucial ROM-based components: a Web browser, a Java virtual machine to run applets, and NTRIGUE client software from Insignia Solutions (Santa Clara, CA) that lets you fire up Windows applications remotely. The @workStation provides excellent browsing and Java applet speed because these operations run locally on an Intel i960 embedded RISC machine.

We tested the @workStation Prima, the 25-MHz model. The basic unit (\$749) comes with 8 MB of RAM, no hard disk, and a 17-inch grayscale monitor. A system with a 15-inch color monitor costs \$1199, while 17-inch color costs \$1499. Our test unit—with 36 MB of RAM (128 MB is tops) and a 15-inch color display—priced out at \$1899.

The browser firmware, licensed from Spyglass (Champaign, IL), loads documents directly from the Web if you let the @workStation have its own IP address (which can be statically or dynamically assigned). To use Windows applications, however, you must run them remotely on an NT server that's running NTRIGUE



@workStation Prima \$1899

(as tested, with 25-MHz i960 processor, 36 MB of RAM, 15-inch color display)

HDS Network Systems
King of Prussia, PA

(800) 437-1551
(610) 277-8300
fax: (610) 275-5739

info@hds.com
<http://www.hds.com>

Circle 1059
on Inquiry Card.

The HDS @workStation uses Insignia Solutions' NTRIGUE to access Windows applications on an NT server.

(\$1995 for five-user license, \$195 per additional user). Computation is done on the server machine, but drawing takes place on the @workStation. Sending the drawing information over the network is relatively slow, but not prohibitively so.

We hooked our test unit through its built-in 10Base-T Ethernet connection to an AST Bravo 200-MHz Pentium Pro system running NTRIGUE. Windows performance on the @workStation was respectable, but the user interface could not duplicate the snappy response of the big machine. For example, when I typed in the NT MS-DOS editor (an old 16-bit application), screen output lagged one or two characters behind. Clearly the network limits the ability for the low-end box to compare with a dedicated PC.

If you're building a network of computers for people who occasionally use Windows applications that are not graph-

ics-heavy, then an array of @workStations could save you money. Hooking up a dozen or so terminals to a good high-end server running NT can cut the cost of hardware and dramatically reduce system upkeep because you have to upgrade only the software on the central NT server. In terms of performance, the @work-

RATINGS				
TECHNOLOGY	★	★	★	★
IMPLEMENTATION	★	★	★	★

Station is comparable to that of a PC when using basic applications like word processing. It falls short when running graphics applications like games. But who plays games at work anyway? **B**

Peter Wayner is a BYTE consulting editor who lives in Baltimore. You can reach him at pcw@access.digex.net.

Introducing
the first PC
worthy enough
to work beside
your trusty
HP printer.



HP Vectra 500 PC



You never give your HP printer a second thought. You just know it's going to work. Now that same HP performance can be found in a line of PCs designed specifically for the demands of small business. The HP Vectra 500 PCs. They all arrive ready to work. Some are HP/Microsoft® Small Business Centers—they're armed with Microsoft Office for Windows® 95 Professional Edition. And to make everything a little more manageable, every Vectra 500 comes with



Designed for

Microsoft®
Windows® 95

free online service and support. Dealers include: Intelligent Electronics, Computerland, Datago, MicroAge, Inacom and CompUSA Corporate. For more information, call 1-800-322-HPPC, Ext. 1557.¹ And see what a good family name can do for you.

FROM **\$1,389***

Minitor or Desktop models:

- Intel 100, 120, 133, 150 or 166 MHz Pentium processor
- 8 or 16MB EDO Memory (128MB max)
- 256KB cache memory²
- 64-bit PCI video
- 2.5GB hard drive³
- 4X, 6X or 8X EIDE CD-ROM Drive⁴
- 28.8 fax/data modem with telephone answering machine⁵
- 16-bit Sound Blaster audio⁶
- Hands-free headset with microphone⁷
- 1-year on-site warranty⁸
- 1-year free phone support for hardware, 90-day free software support

¹In Canada, call 1-800-387-3867. *Average U.S. street price for Pentium® processor-based HP Vectra 510 5/75 PC. Monitor not included. HP Vectra 500 PCs come with Microsoft Windows 95 preinstalled. ²Standard on 133 and 166 MCx models, optional on all other models. ³Other capacities available. ⁴Standard on CD, MC and MCx models. ⁵Multimedia models only. ⁶On-site, second-day business service. Microsoft and Windows are U.S. registered trademarks of Microsoft Corporation. Pentium and the Intel Inside logo are registered trademarks of Intel Corporation. ©1996 Hewlett-Packard Company PPG429

HP PCs For Small Business



PEAK PERFORMANCE IS THE NAME OF THE GAME

The name of the book to get you there is the

BYTE Guide to Optimizing Windows 95

Don't let Windows 95 run your life. With the **BYTE Guide to Optimizing Windows 95**, you're in control. Filled with fresh solutions and optimizing shortcuts, you'll find slick tips and expert advice on

- *Installing Windows 95*
- *The Internet*
- *Multimedia*
- *Handling old Windows and DOS applications*
- *Networking with Windows*
- *Troubleshooting... and much more*

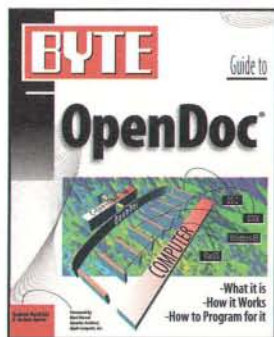
You'll also get the real scoop on hardware issues and third-party products. An ideal guide and handy reference, you'll turn to the **BYTE Guide to Optimizing Windows 95** again and again as you power up Windows 95 to your standards.



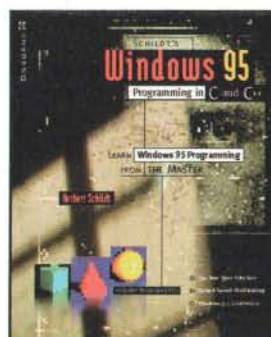
BYTE Guide to Optimizing Windows 95
by Lenny Bailes
with Bermant, Menefee, and Heilborn
\$29.95 USA
ISBN: 0-07-882120-7



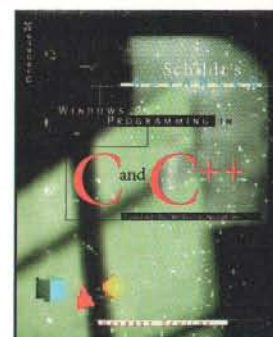
BYTE Guide to CD-ROM, Second Edition
by Michael Nadeau
Includes One CD-ROM Disc
\$39.95 USA
ISBN: 0-07-882104-5



BYTE Guide to OpenDoc
by Joshua Susser & Andrew MacBride
\$29.95 USA
ISBN: 0-07-882118-5



Schildt's Windows 95 Programming in C and C++
by Herbert Schildt
\$29.95 USA
ISBN: 0-07-882081-2



Schildt's Advanced Windows 95 Programming in C and C++
by Herbert Schildt
\$29.95 USA
ISBN: 0-07-882174-6

OSBORNE

<http://www.osborne.com>

CODE=SF36BYL

Available now at your local book and computer stores
or call 1-800-822-8158 and use your American Express,
VISA, Discover, or MasterCard.

A Division of The McGraw-Hill Companies

AT NATIONWIDE STORES

BYTE/OSBORNE BOOKS ARE AVAILABLE AT THE FOLLOWING LOCATIONS

BARNES & NOBLE

BEST BUY

BOOKSTAR

BORDERS

COMP USA

ELEK-TEK

MEDIA PLAY

MICRO CENTER

SOFTWARE, ETC.

SUPER CROWN

TAYLORS

WALDENBOOKS

ARIZONA

Tempe
Computer Library
PH: 602-820-0458

CALIFORNIA

Capitola
Capitola Book Cafe
PH: 408-462-4415
FAX: 408-462-2536

Cupertino

A Clean Well Lighted Place
PH: 408-255-7600

Stacey's Professional
Bookstore
PH: 408-253-7521
FAX: 408-253-5861

Irvine

Irvine Sci-Tech Books
PH: 714-733-1002
FAX: 714-733-0122

Los Angeles

OPAMP Technical Books
PH: 800-464-4322
FAX: 213-464-0977

Menlo Park

Kepler's Books &
Magazines
PH: 415-324-4321

Mountain View

Tower Books
PH: 415-941-7300

Palo Alto

Stacey's Professional
Bookstore
PH: 415-326-0681
FAX: 415-326-0693

Sacramento

Tower Books
2538 Watt Avenue
PH: 916-481-6600

San Diego

San Diego Technical
Book, Inc.
PH: 800-346-0071
FAX: 619-279-5088

San Jose

Computer Literacy
Bookshops
PH: 408-435-1118
EMAIL: info@cibooks.com

San Luis Obispo

El Corral Bookstore
CAL Poly SLO
PH: 805-756-1101
FAX: 805-756-5351

Santa Barbara

Earthling Bookshop
PH: 805-965-0926

Stanford

Stanford Bookstore
Stanford University
PH: 800-533-2670

COLORADO

Boulder
Biblio Tek
PH: 303-443-7037

Colorado Springs

McKinze-White
Booksellers
PH: 719-590-1700
FAX: 719-531-7631

Denver

Auraria Book Center
PH: 303-556-3230

Tattered Cover Bookstore
PH: 303-322-7727

Englewood

Softpro Books
PH: 303-740-7751
FAX: 303-740-8152

DELAWARE

Newark
University Bookstore
University of Delaware
PH: 302-831-2637

GEORGIA

Atlanta
Engineers Bookstore
PH: 404-221-1669
FAX: 404-221-1119

HAWAII

Honolulu
Honolulu Book Shops
PH: 808-536-9512
FAX: 808-538-7580

IDAHO

Moscow
University of Idaho
Bookstore
University of Idaho
PH: 208-885-6469

IOWA

Ames
Iowa State University
Book Store
PH: 515-294-5684
FAX: 515-294-5669

MARYLAND

College Park
University Book Center
University of Maryland
PH: 301-314-7855
FAX: 301-403-8326

MASSACHUSETTS

Boston
Waterstone's Booksellers
PH: 617-859-7300
FAX: 617-437-0997

Cambridge

Harvard/Co-Operative
Society
PH: 617-499-2000
FAX: 617-868-7038

Wordsworth Books

PH: 617-498-0080
FAX: 617-354-4674

Worcester

Tatnuck Bookseller/
Databooks
PH: 800-642-6657
FAX: 508-756-9425

MINNESOTA

Minneapolis
Baxter's Books
PH: 612-339-4922
PH: 800-626-1049
FAX: 612-339-6134
EMAIL:
tombaxter@aol.com

NEBRASKA

Lincoln
Nebraska Bookstore
PH: 402-476-0111
FAX: 402-476-0111

NEW JERSEY

Newark
Newark Book Center
PH: 201-642-7956
FAX: 201-642-3345

Princeton

Princeton University Store
PH: 609-921-8500
FAX: 609-924-9651

NEW YORK

Blasdell
Village Green Bookstore
PH: 716-827-5895
FAX: 716-827-5898

Fairport

Village Green Bookstore
PH: 716-425-7950
FAX: 716-425-4968

New York

Barnes & Noble #200
PH: 212-807-0099

Classic Bookstore
PH: 212-466-0668
FAX: 212-466-0363

Computer Book Works
PH: 212-385-1616
FAX: 212-385-8193

McGraw-Hill Bookstore
PH: 212-512-4100
FAX: 212-512-4105

Tower Books

PH: 212-228-5100
FAX: 212-228-5338

Rochester

Total Information, Inc.
PH: 716-254-0628
FAX: 716-254-0153

World Wide News
PH: 716-546-7146

NORTH CAROLINA

Chapel Hill
Bull's Head Bookshop
PH: 919-962-5060
FAX: 919-962-7392

OHIO

Cincinnati
University of Cincinnati
Bookstore
PH: 513-556-1800
FAX: 513-556-5555

Dayton

Books & Co.
PH: 513-298-6540
FAX: 513-298-7895

Wilkie's South

PH: 513-434-8821

Kent

Kent State University
Bookstore
PH: 216-672-2762
FAX: 216-672-3758

Lima

Readmore's Hallmark
2100 Harding Hwy
PH: 419-229-2601

OREGON

Beaverton
Book Vault
PH: 503-646-8119
FAX: 503-646-4459

Corvallis

Oregon State University
Bookstore
PH: 503-737-4323
FAX: 503-737-3395

Portland

Portland State Bookstore
PH: 503-226-2631
FAX: 503-725-3800

Tower Books

PH: 503-253-3116
FAX: 503-253-4189

PENNSYLVANIA

Edwardsville
Village Green Bookstore
PH: 717-283-9340
FAX: 717-283-9367

King of Prussia

Gene's Books, Inc.
PH: 610-265-6210
FAX: 610-265-6260
EMAIL:
genes1@netaxs.com

Philadelphia

Tower Books
PH: 215-925-9909
FAX: 215-923-5969

Pittsburgh

Carnegie Mellon
University Shoppe
PH: 412-268-2966
FAX: 412-268-5592

West Chester

Chester County Book
Company
PH: 610-696-1661
FAX: 610-429-9006

TENNESSEE

Knoxville
University Book &
Supply Store
University of Tennessee
PH: 615-974-1049

TEXAS

Arlington
University Bookstore
University of Texas
Arlington
PH: 817-273-2785

Dallas

Major's Scientific Books
PH: 214-631-4478

Denton

University Bookstore
University of North Texas
PH: 817-565-2592

Houston

Major's Scientific Books
PH: 713-522-1361
FAX: 713-524-5860

VIRGINIA

Blacksburg
Volume II Bookstore,
Virginia Tech
PH: 703-231-5991
FAX: 703-231-7786

WASHINGTON

Bellevue
Tower Books
PH: 206-451-1110
FAX: 206-454-0453

Bellingham

Students Cooperative
PH: 206-650-3958

Seattle

Elliot Bay Book Co.
PH: 206-624-6600
FAX: 206-343-9558

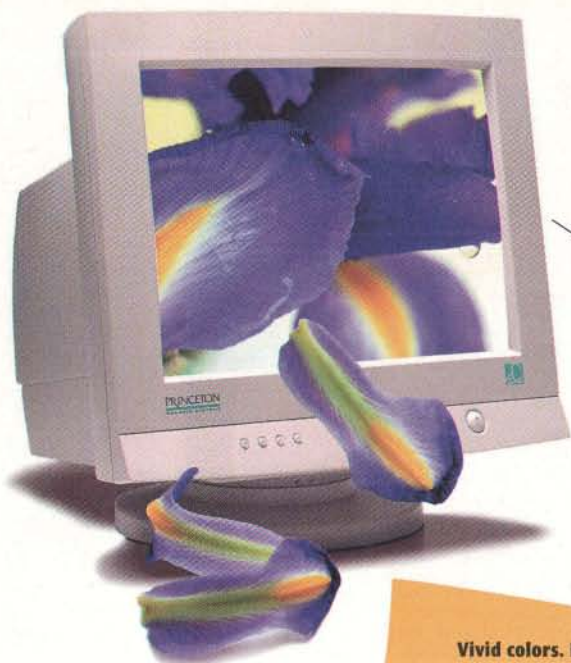
University Bookstore
PH: 206-634-3400
FAX: 206-634-0810

WASHINGTON DC

Washington DC
Reiter's Scientific &
Professional Books
PH: 800-537-4314
FAX: 202-296-9103

WISCONSIN

Milwaukee
Harry W. Schwartz
Bookshop
PH: 414-274-6400
PH: 800-236-7323
FAX: 414-274-6408



“The
HEART
of an
Artist”

EO75
EO SERIES

Vivid colors. Ergonomic design. Performance and features to indulge the visionary in you.

Princeton Graphic Systems® monitors have always had a solid reputation for pushing performance barriers far beyond industry standards. This tradition was proven with the highly respected Ultra 15 which won *PC World's* Best Buy Award a remarkable three times in a row. The 135MHz/82KHz Ultra 17+ further redefined the industry with its award-winning, high refresh rate performance and ultra-low price. Now, our **ExtraOrdinary** new models surpass even our own stellar benchmarks.

Case in point, the EO75. With its super-high 95KHz horizontal frequency, 200MHz video bandwidth and an ultra-fine 0.26mm dot pitch, this 17" (15.8" viewable) monitor delivers a bold, flicker-free resolution of 1600 x 1200 @ 75Hz. That's rock-solid performance. Furthermore, our engineers added Enhanced Imaging Circuitry for a sharper focus without the moiré problems so common to other 0.26mm monitors. That's a difference you can see!

Princeton's next generation of EO monitors incorporates PreVu™ controls and Coloright™ technology perfect for intense, graphical applications. In addition, Princeton offers an **ExtraOrdinary**, full three year "Bucket to Bezel" limited warranty*.

The EO Series is already available at your nearby dealer. See it today. Their performance will win your heart. Their price will ease your soul.



“The **SOUL** of an
Accountant”

\$722^{ESP}



Princeton Graphic Systems • 2801 S. Yale St., Ste. 110 • Santa Ana, CA 92704 • Tel. 800/747-6249 or 714/751-8405 • Fax 714/751-5736 • Fax-On-Demand 714/751-0168 • Web Site: www.prgr.com

© 1996 Princeton Graphic Systems. All rights reserved. All trademarks are the properties of their respective owners. As an Energy Star™ Partner, Princeton Graphic Systems has determined that these products meet Energy Star™ Guidelines for energy efficiency. Prices and specifications are subject to change without notice. *PreVu™ and Coloright™ are not available on the EO40. Full three-year limited warranty is offered on the following models: EO40, EO50, EO17, EO70 and EO75.

COMDEX
Fall '96 Las Vegas Convention Center
Booth No. LS205

PRINCETON®
GRAPHIC SYSTEMS

800-747-6249 ext. 165

Innovative optics and integrated Adobe Player firmware make Proxima's new projector a presentation stunner. By G. Armour Van Horn

Road-Show Romance

By combining Texas Instruments' Digital Light Processor (DLP) optics and Adobe Acrobat technology into its Desktop Projector 4100Z, Proxima has set a new standard for direct digital projection systems. The \$7750 DP4100Z uses DLP optics to project bright, sharp, 24-bit, 640-by-480-pixel color images through its 1.5-to-1 zoom lens. With the optional Media Express package (\$1495), you can present slides in Acrobat .PDF file format without an attached computer.

After carrying the unit through several airports on a speaking engagement, I have only one complaint: its 27-pound weight. That said, the projector's brightness (350 ANSI lumens), clarity, and flexibility impressed fellow speakers.

The DP4100Z's DLP display engine uses an active semiconductor reflective surface that modulates red, green, and blue images in turn as a tricolor filter rotates through the illumination source (see "Micromirrors Project Better Images," July BYTE). The filter absorbs less



Desktop Projector 4100Z
\$9745

(with Media Express option and 540-MB hard drive)

Proxima Corp.
San Diego, CA

(800) 447-7692
(619) 457-5500
fax: (619) 457-9647

<http://www.prxm.com>

Circle 976
on Inquiry Card.

Adobe Acrobat technology turns the DP4100Z into a presentation appliance. DLP optics provide big, bright, razor-sharp images.

light than polarizers, so the image is brighter than images from LCD-based projectors. Because the same addressable matrix forms the three component images, there is no color misregistration.

The DP4100Z accepts 24-bit video from two computers, has RCA jacks and S-Video inputs for two video sources, and accepts stereo sound from all four. Other connections include a microphone jack, a serial-mouse connector, and outputs for VGA and stereo sound. Its 3-W stereo speakers face backward.

The Media Express option includes Acrobat Exchange PDF editing software (five-user Windows and Mac licenses; Unix is optional), an internal floppy drive to hold PDF presentations, and a plug-in cartridge with a Motorola 68EC040 processor and Acrobat Player firmware to present the slides. Exchange lets you rotate images (a crucial feature), establish transitions between slides (e.g., wipes, window blinds, zooms, and dissolves), crop, set display intervals, and

combine different presentations. The cartridge firmware includes limited Exchange capabilities: deleting and sorting slides, adding some transitions, and setting intervals.

The optional Optimizer plug-in com-

RATINGS

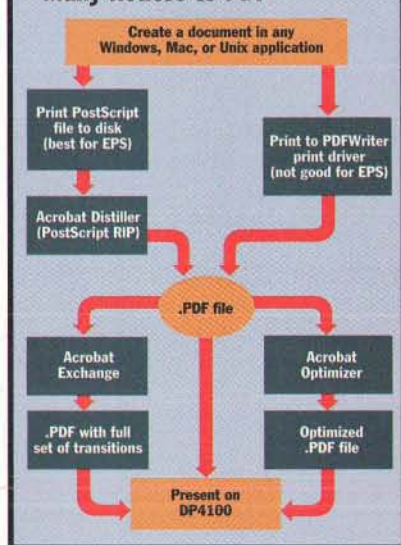
TECHNOLOGY	★	★	★	★	★
IMPLEMENTATION	★	★	★	★	

presses PDF presentations. You can fit 1000 slides on a floppy disk. An optional 540-MB hard drive increases capacity.

Equipped with Media Express, the DP4100Z is both a sophisticated presentation system and an "appliance" that requires only the remote control to advance from slide to slide—you can leave your notebook home. Either way, the DLP optical system is superb. **B**

G. Armour Van Horn is a production artist and consultant in electronic imaging and prepress. You can reach him at vanhorn@bix.com.

Many Routes to PDF

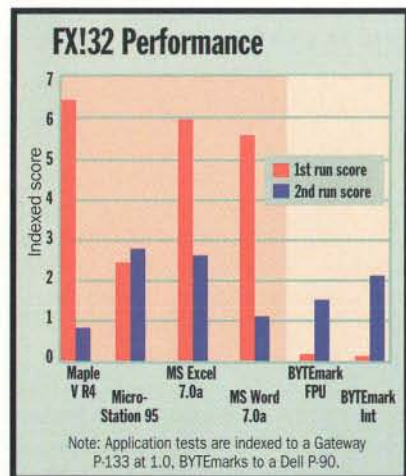


Digital's FX!32 is the key to running Win32 software on Alpha/Windows NT. By Selinda Chiquoine

Alpha Learns to Do Windows

Executing code written for one CPU on another has always been like the talking dog: Though she didn't speak very well, the wonder was that she could do it at all. A new application from Digital Semiconductor has changed the way we think about emulators and what they can do. FX!32 lets you run 32-bit x86 Windows programs on Alpha/NT systems at surprising speeds. Depending on the applications and how they are used, they might run faster on an Alpha system than on a high-end Intel machine, though never as fast as native Alpha programs. In our tests, FX!32 1.0 achieved about 40 percent to 50 percent of the performance of the same code compiled for Alpha.

BYTE editors gave FX!32 the Best Technology award at Comdex last fall because it breaks the emulator mold. It looks at the instructions you're using and translates some of them into native Alpha code, saving the result in a separate DLL. It intercepts system calls and directs them to a native Alpha library. FX!32 thus combines both translation and interpretation, saving execution profiles and analyzing them heuristically (see "An Alpha in PC Clothing," February BYTE).



FX!32 Manager

File Edit View Options Help

Application Name	Size	Run Count
Adobe Photoshop 3.0.5	3479596	6
FASTBOOT.EXE	26708	20
FINDFAST.EXE	1372772	20
Mathcad 6.0 6.00	3955468	19
Microsoft Excel 7.0a	6420272	7
Microsoft Office 7.0a	1437056	20
Microsoft Access 7.00	5784928	1
Microsoft Visual C++ 2.10.000	111248	21

Image Name	Size	Run Count
AGM.DLL	48588	6
ALPARSER.8by	5188	6
CSDTRN32.DLL		
ctl3d32.dll		
FastCore.8BX		
msvcrt10.dll		
MThread.8BX		
photos01.dll		
photos02.dll		
photoshp.exe		
PLUGIN.DLL		
Pressure.8BX		

FX!32 1.0 free

(requires Windows NT 4.0)

Digital Semiconductor
Hudson, MA

(508) 628-4724 ext. 32
(800) 332-2717 ext. 32
fax: (508) 626-0547

<http://www.digital.com/info/semiconductor>

Circle 1050 on Inquiry Card.

Preferences

Database directory: D:\fx32\data

Maximum disk usage: 104857600

Current usage (bytes): 25229108

Re-Optimize threshold: 25

☐ Interpret only

The FX!32 Manager reports the status of Win32 applications and background code optimization.

I tested FX!32 on a 466-MHz Alpha system with 128 MB of RAM running a beta version of Windows NT 4.0. The BYTEmark test results are summarized in the chart. The FX!32 translations ran at 47 percent (integer) and 32 percent (floating point) of native speeds. Straight emulation clocked at 2 percent to 3 percent.

I also ran scripts using Microsoft Visual Test 4.0, Word 7.0a, Excel 7.0a, Bentley Systems' MicroStation 95, and Maple V release 4. Because FX!32 translates only those parts of an application that you execute, scripts and users that use different commands and system calls will produce different results. Most applications will have a relatively slow first run and increasingly fast second or third run. After that, performance gains taper off.

You can set a maximum disk space allotment for translations, delay optimization, optimize now, delete translated

code, or set optimization profile sizes. FX!32 itself takes up 10 MB. Its translations are between one and two times the size of the original code.

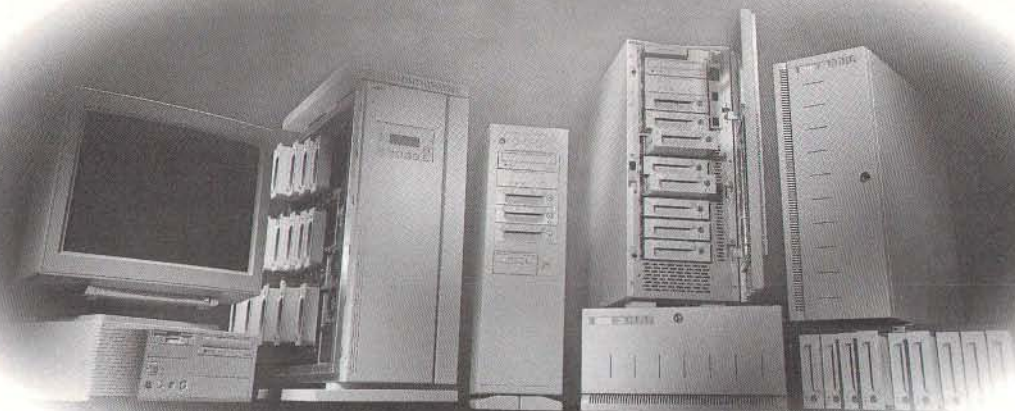
The real value of FX!32 is that Alpha users no longer need an Intel system to use Win32 applications. For 16-bit Win-

RATINGS	
TECHNOLOGY	★★★★★
IMPLEMENTATION	★★★★★

dows applications, however, you'll need Insignia Solutions' SoftWindows, a traditional (slow) emulator.

Digital will offer FX!32 free to Alpha customers and bundle it with all Alpha systems. FX!32 should end Alpha critics' cries of, "Where's the software?" **B**

Selinda Chiquoine is a former BYTE technical editor. You can reach her at selinda@bix.com.



built to order

High Quality Custom-Configured Systems at Off-the-Shelf Prices

Want a custom system?

Until SAG, that meant high-priced VARs and other costly consultants.

Want to save money without compromising on quality?

Until SAG, your only options were pre-configured systems and their many limitations.

Precision-Engineered Power Systems

Now you can have custom quality configurations without compromise. All SAG workstations and systems are

precision-built and packed with features. We offer the latest in technology with speed, data integrity, and compatibility in mind. For affordable disk arrays, tape backup solutions and RAID 5 technology, SAG Electronics is the acknowledged "High-End Solutions Company."

The Choice Web Server Companies like *Business Week Magazine* are choosing SAG Electronics as their high performance web server solution.



Quad Pro 200MHz	Dual Pro 200MHz SMP	Dual 200MHz SMP RAID 5	Alpha 433 Power System	Dual Ultra Graphics 200MHz
2 Intel Pentium Pro® Processors Exp. to 4 64MB of ECC 4 way Interleaved Memory to 1GB Slots (6) PCI; (4) EISA Adaptec 2940 UW 9.1GB 7200RPM Ultra Wide HD Sony 8x CD-ROM #9 2MB DRAM Video 8GB DAT Drive Quad PCI Ethernet 10/100 Floppy, Keyboard and Mouse 12 Bay Tower 450 Watt Power	Contains Intel's New Pentium Dual Pro Motherboard Built-in Expandability with SMP Natoma Chipset 1 Intel Pentium® Pro 200 Processor 32MB of 60 NOS RAM Expandable To 512MB ECC Supported Imagine 128 Series II 4 MB VRAM Open Slots: (3) PCI, (1) ISA Adaptec 2940 Ultra Wide Controller 16 Bit Sound Card 4.1GB Ultra Wide SCSI HD (8ms) Intel 10/100 Ethernet Sony 8x CD-ROM Keyboard, 2.88 Floppy, Mouse Hardware Monitoring Utility Tower Case 300 Watt	1 Intel Pentium® 200MHz Processor, Upgradable to 2 CPUs 512K Pipeline Cache 32MB EDO 3 4GB 7200 RPM Removable HD RAID 5 Controller Slots (4) PCI, (4) EISA 10 Bay Tower 300 Watt Redundant Power Supplies Sony 8x CD-ROM Keyboard, Mouse	256 Bit Bus 1MB SRAM Cache 1 DEC 433MHz Alpha CPU 64MB RAM to 1GB Sony 8x CD-ROM ELSA Gloria 8 Video Card 4GB 7200 RPM SCSI Wide HD (8ms) Slots (4) PCI, (2) ISA Tower 300 Watt	Imagine 128, Fastest Graphics, Drive Supports Intel Pentium 200, 166MHz Pentium Processor 1 Intel Pentium® 200MHz Processor, Upgradable to 2 CPUs Triton II Chipset 16MB RAM Expandable to 256MB Slots (4) PCI, (4)EISA Sony 8x CD-ROM Floppy, Mouse Imagine 128 Series II 128 Bit "3D" 4MB VRAM Video 2940 UW 2.1GB Ultra SCSI Wide HD (8.5ms) 32 PNP Sound Midtower Case MAG NXP17F Monitor \$3478 3.2GB IDE Solution (9.5ms) \$3333
\$10700	\$3473	\$6899	\$7990	

AT&T on-site and 4 year extended warranties are available. Lease options available. Returns may be subject to restocking fee. BMAP must be acquired. Some devices have not been approved by the Federal Communications Commission. These devices are not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained. GSA Schedule #G28-35F-3103D

SAG
ELECTRONICS
More Server Power, for Less

1.800.989.3475

SAG Electronics • 451 Andover Street • North Andover, MA 01845
508-682-0055 Fax 508-689-0188 Hours: 8:30am-7:00pm, Monday-Friday EST
5 Year Limited Warranty
<http://sagelec.com>



February 20, 1996
SAG STF 150 Pentium



February 20, 1996
SAG STF 166 Pentium



120MHz Pentium STC 120



Internet Server SFT Alpha

A developer's dream come true...



#1 Protection Supplier

You'll have peace of mind with your software backed by world leader Rainbow

Leading Technology

Sentinel® is the *only* protection combining multiple algorithms and ASIC technology



The Highest Quality

Only Sentinel keys meet ISO quality standards and offer the best reliability

Truly Compatible Security

The industry's largest engineering staff is dedicated to making your software safe on any platform

Increase Your Revenue

Sentinel stops piracy, ensuring you that every user of your software is a paying customer



NEW

The SentinelWizard™ GUI is an innovative tool that makes protecting your software easier than ever



The world's #1 software protection is now the easiest to implement!

You've always dreamed of superior software protection that was simple to integrate into your entire product line. The new SentinelWizard makes your dream a reality.

Just tell the SentinelWizard how you want to sell your products. It then automatically configures your Sentinel keys and generates the pseudo code necessary to complete the protection process.

Call the Rainbow office or distributor nearest you to order your Sentinel Developer's Kit, featuring the SentinelWizard.



Ask us about SentinelLM™ - the new software-based network license manager

Visit our web site
www.rnbo.com

SENTINEL
Software Protection
Circle 154 on Inquiry Card.

RAINBOW
TECHNOLOGIES

HEADQUARTERS: 50 Technology Drive, Irvine, CA 92618 ■ Tel: (714) 450-7300 ■ Fax: (714) 450-7450
ASIA/LATIN AMERICA: (714) 450-7300 ■ FRANCE: (33) 1 41 43 29 00 ■ GERMANY: (49) 89 32 17 98 0 ■ U.K.: (44) 1932 579200
©1996 Rainbow Technologies, Inc. Sentinel, SentinelLM and SentinelWizard are trademarks of Rainbow Technologies. All other names are property of their respective owners.

ALGERIA: AFAK (213) 41 85 61
ARGENTINA: Agri-Aid, S.A. (54) 1 8030536
AUSTRALIA: LOADPLAN (61) 3 9690 0455
BELGIUM/LUXEMBURG: E2S (32) 92 21 11 17
BRAZIL: MIPS Sistemas Ltda. (55) 11 574 8686
BULGARIA: KSIMETRO (35) 9279 1478
CHINA (East): Shanghai Pudong Software Park Electronics Company (86) 21 6403 1966
CHINA (North): CS&S (86) 10 6217 7722 X2404
COLOMBIA: Construdata (57) 1 622 6011

CZECH REPUBLIC: ASKON Int'l (42) 2 3103 652
EGYPT: ZEDAN-ADS (202) 248 8994
GREECE: Byte Computer S.A. (301) 924 17 28
GUATEMALA: Soft Corporation (502) 2 304006
HONG KONG: Allalink Tech. Co. (852) 2333 0626
HUNGARY: Polyware Kft (36) 76 481 236
INDIA: ANC Engineering Co. (91) 11 4615680
INDONESIA PT. Promptrade InfoScan (62) 21 375 166
IRAN: GAM Electronics (98) 21 87 44 001
ITALY: BFI IBEKSA SPA (39) 23 31 00535

ITALY: Siosistemi (39) 30 24 411
JAPAN: Giken Shoji Co., Ltd. (81) 52 972 6544
JORDAN: CDG Engineering (96) 26 863 861
KOREA: Genesis Technologies (82) 2 578 3528
LEBANON: National Group Cons. (961) 1 494317
MALAYSIA: Eastern Systems Design (M) Sdn Bhd (60) 3 241 1188
MEXICO: Impex Comp., S.A. de C.V. (52) 66 210 291
MOROCCO: Futur & Soft (212) 2 40 03 97

NETHERLANDS: IntroCom (31) 74 2430 105
NEW ZEALAND: Software Images (64) 09 378 9790
PERU: OpenSoft (51) 1 224 2125
PHILIPPINES: Mannasoft Technology Corporation (63) 2 813 4162
POLAND: HITEX Sp. z o.o. (48) 22 41 97 51
PORTUGAL: COMELTA (351) 1 941 65 07
RUSSIA: Multisoft Int'l (7 095) 186 35 84
SAUDI ARABIA: ZEDAN (966) 2 665 1904
SCANDINAVIA: Perico A/S (47) 2249 1500

SINGAPORE: Systems Design PTE LTD (65) 747 2266
SOUTH AFRICA: SOFTSECURE (27) 11 477 6053
SPAIN: MECO (34) 3 422 7700
SWITZERLAND: IBV AG (41) 1 745 92 92
SWITZERLAND: Safe Compaid S.A. (41) 2 421 5386
TAIWAN: Evershine Tech. (886) 2 8208925
THAILAND: BCS Int'l (66) 2 319 4451
TUNISIA: Soft Informatique Tech (216) 17 19 486
TURKEY: BIMEKS, Ltd. (90) 216 348 3508
VENEZUELA: HRT-M Osers (58) 2 261 4282

New Windows 95 features assist computer users who have disabilities. By Joseph J. Lazzaro

Windows 95: Aiding the Disabled

If you run an office staffed with more than 15 employees, you must comply with the Americans with Disabilities Act. This may require that you provide adaptive hardware and software on office workers' computers. Such equipment enables workers with disabilities to accomplish many tasks independently. For example, if you are blind, it can transform on-screen text to synthesized speech or braille. If you can't hear, adaptive hardware transforms a computer's audible cues into a visual format.

So far, adaptive technology has consisted of third-party add-ons to OSes, with the exception of the Mac. This has resulted in adaptive equipment that only sometimes works. Fortunately, because of lobbying by the disabled community, OS vendors have begun to embed adaptive-access features directly into their OSes. This makes such features widely available right out of the box, more reliable, and a lot less expensive.

Microsoft began to build a suite of disability-access features starting with Windows 3.x. Win 95 offers access to a built-in set of utilities that accommodate users with hearing, motor, and some visual disabilities. Furthermore, the Win 95 Help system includes information on these built-in accessibility features.

The control and configuration of most of these features are centralized in an Accessibility Options Control Panel, as shown in the screen at right. This Control Panel lets you activate or deactivate specific access features and customize timings and feedback for certain utilities. It also lets you set hot keys so that you can activate these features quickly.

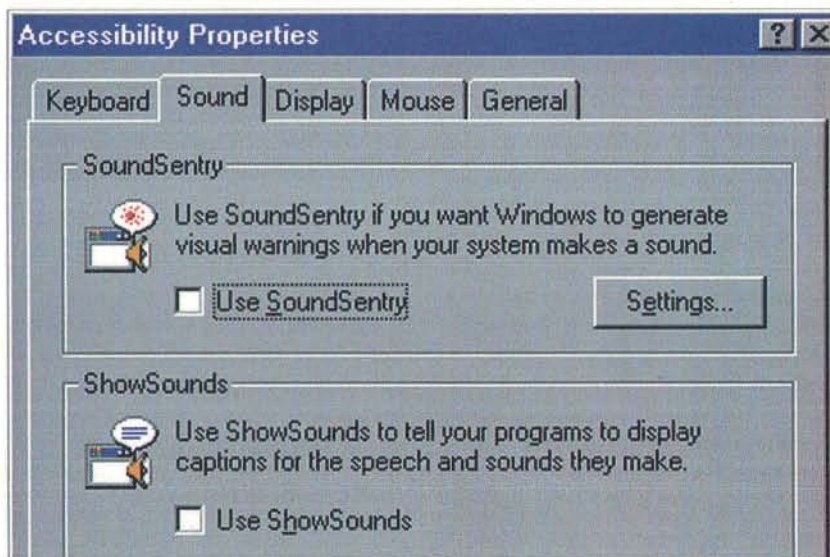
Keyboard and Mouse

Using a keyboard requires a significant amount of hand dexterity, particularly when using the modifier keys, such as

Shift, Control, and Alt. For persons unable to use a standard keyboard or mouse easily—if at all—several Win 95 utilities can help by altering the keyboard's behavior. You can configure these utilities in a pane on the Accessibility Options Control Panel.

The StickyKeys utility, for instance, helps you type capital letters or manage complex key sequences, like Control-Alt-

ToggleKeys is a utility that provides audio feedback for certain keystrokes. This is a useful tool for computer users who are unable to determine the status of the keyboard's modifier keys by using any other method. The ToggleKeys utility provides both high- and low-pitched beeps that indicate the current status of the Caps Lock, Num Lock, and Scroll Lock keys.



You can configure Win 95 to accommodate users with hearing, motor, and some visual disabilities.

Delete, that require the use of both hands. StickyKeys lets you press one key at a time in a sequence instead of pressing multiple keys simultaneously.

Another powerful utility, FilterKeys, helps users who accidentally strike keys by filtering out those keystrokes that do not fall under a user-definable time duration. In other words, for a key press to become a valid keystroke, it must be held down long enough to register. Any keystrokes that don't last for the specified duration are discarded.

Driving a mouse demands strong hand/eye coordination and good hand/arm agility. It's a prerequisite for using the GUIs on many of today's desktop computers. MouseKeys assists users who have difficulty pointing the rodent. The program lets you use the arrow keys on the keyboard's numeric keypad to move the mouse pointer around the screen and emulate mouse actions, such as clicking, double-clicking, dragging, and dropping. Holding down the Control key accelerates pointer movement, while holding

down the Shift key propels the pointer a pixel at a time, offering fine-grained control.

Video and Sound

For persons who have difficulty seeing images on a standard computer screen, Win 95 offers several features that make the monitor easier to see. Some of these features are simply a matter of adjusting certain Control Panel settings. For example, if you are visually impaired, you can use the Display Panel to scale the size of various user-interface elements, such as window titles, scroll bars, borders, menu text, and icons.

The Mouse Control Panel allows you to adjust the mouse pointer's characteristics. You can select from among several sizes (small, medium, and large), which is valuable for users with limited vision or learning disabilities. You can also adjust the pointer's color and apply animation effects to increase its recognition factor and visibility.

For users with limited vision, color plays an important role in their ability to read comfortably—or at all. Again, Win 95's built-in customization features enable you to modify the color scheme of the environment. You can select a high-contrast mode or choose from several ready-made appearance schemes that make it easier for users with limited vision to focus on the screen. The Accessibility Options Control Panel allows you to set a global flag that instructs your applications to employ the high-contrast color scheme, as shown in the screen above. It also enables you to avoid schemes that are difficult to see, such as text that's displayed over pictures.

For users who are deaf or hearing-impaired, Microsoft has implemented several useful features into Win 95 that increase access to the computer and its data.

This is of vital importance as many applications begin to use text-to-speech or audio playback.

Win 95's SoundSentry lets you have sounds presented in an alternative format, such as visually or through text captions. ShowSounds lets you set a global flag that displays sounds in a visual format. This can be accomplished by several methods, depending on your preference.

is one of the latest Win 95 screen readers to enter the market. ASAW works with Win 3.x and Win 95 applications. Biolink's ProTalk32 is a screen reader for Win 95. A Win 3.x and NT version is also available. Winvision, from Artic Technologies, runs on both Win 3.x and 95 and supports several commercially available speech synthesizers. Winvision also drives braille displays, providing a tactile rep-



A high-contrast layout makes for easy reading, but not all applications (such as the toolbar on the left) support this feature.

For instance, you can have the active window flash every time a sound is generated or display text captions that represent the sounds.

Third-Party Speech-Access Products

Despite all these improvements, Win 95 still lacks critical support for users who are totally blind and must rely on speech-synthesis systems to read the information on a computer screen. Microsoft plans to implement an off-screen model that captures on-screen information so that special-purpose software can perform a text-to-speech conversion on it or drive a braille-output device.

Unfortunately, the hooks to this mechanism might still be unavailable when this article sees print. This sorry state of affairs presents an opportunity for third-party access technology, chief among them speech- and braille-output packages designed to read the screen.

The Automatic Screen Access program for Windows (ASAW), from MicroTalk,

resentation of Windows screens. Syntha-Voice's Window Bridge, which runs under Win 3.x, Win 95, and DOS, was the first Windows-based screen reader to enter the adaptive market.

Computers play a major role in our society; they're used at home, at school, and on the job. It only makes sense for OSes to provide adaptive-access features. This makes the computer accessible to everyone, no matter what their abilities, so they can make a contribution in the workplace. Microsoft has done a commendable job so far with much-needed improvements to Win 95. But the company still has a lot of work to do if Windows is going to provide OS-level support for blind computer users. **B**

*Joseph J. Lazzaro is the author of *Adapting PCs for Disabilities* (Addison-Wesley, 1996). He is also project director of the Adaptive Technology Program at the Massachusetts Commission for the Blind in Boston. You can reach him at lazzaro@world.std.com or at lazzaro@bix.com.*

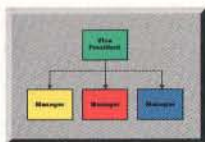
WHERE TO FIND

Artic Technologies
Troy, MI
(810) 588-7370
fax: (810) 588-2650

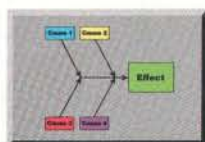
Biolink
North Vancouver,
British Columbia,
Canada
(604) 984-4099
fax: (604) 985-8493
<http://biz.bct61.net/biolink>

MicroTalk
Texarkana, TX
(903) 792-2570
fax: (903) 792-5140
<http://www.screenaccess.com>

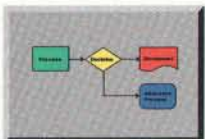
Syntha-Voice
Stoney Creek,
Ontario, Canada
(905) 662-0565
<http://www.synthavoice.on.ca/~davidk>



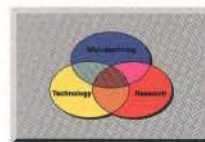
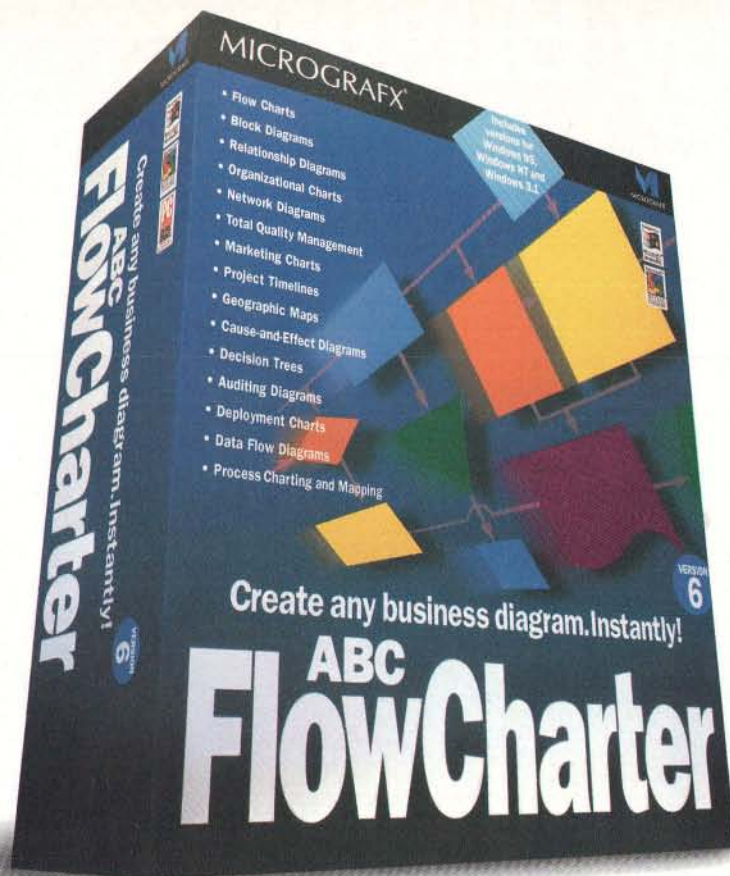
Human resource tools like organization charts and relationship diagrams



Management support diagrams like cause & effect, decision trees and timelines



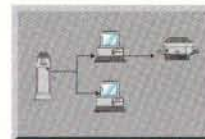
Business process re-engineering diagrams like flow charts and data flow diagrams



Marketing tools like venn diagrams, targets, pyramids and geographic diagrams



Total quality management diagrams like process charts and maps



IT and software design tools like network diagrams and object oriented design diagrams

ROCKET FUEL FOR THE BUSINESS PROCESS

Great businesses run fast. As fast as you can make obstacles disappear. That's why you need ABC FlowCharter®6. It shows you your business. Clearly. With diagrams that add a boost to your entire business process.

ABC FlowCharter is not just another drawing tool. It actually lets you relate charts to data, and automatically analyze the results. Unlike diagramming tools that hit the wall at the edge of the page, ABC FlowCharter is powerful. It can diagram any process. Across any number of pages. No matter how complex. With lines that re-route automatically and shapes that drop into place. In fact, it's so powerful,

it's used as the engine for Process Model®—the world's most advanced business simulation tool.

ABC FlowCharter does the work, while you work on making your business run better. See for yourself. Pick up your copy of ABC FlowCharter 6 today. If you want even more graphics power, you'll find ABC FlowCharter bundled in ABC Graphics Suite™. Visit your favorite reseller, or call 800-428-8716 now.



MICROGRAFX®

www.micrografx.com



Softmart
The smart resource for business
1-800-328-1319

SOFTWARE SPECTRUM
1-800-624-0503

Stream
1-800-SOFTWARE

Display Business Savvy.



Whether your business relies on basic spreadsheets or the most advanced multimedia applications, ViewSonic® has the perfect Graphics Series monitor for YOU! In fact, our Graphics Series offers NINE different monitors, ranging from 15" through 21" (various viewables) for both PC and Mac® systems. Each provides a unique combination of performance, features, value and screen size to meet your specific needs.

Graphics Series Monitors

Our Graphics Series offer features like OnView® controls for easy on-screen adjustments, ViewMatch® to match screen color to printer output, and overscan capabilities which provides use of the entire screen. And *Plug & Play*® for easy installation with Windows® 95.

For multimedia, personnel training and internet applications, the Graphics Series PerfectSound™ 15GA and 17GA multimedia monitors are the ideal choice.

Product	CRT Size/ Viewable	Dot Pitch Aperture Grille*	Max. NI Resolution	OnView Controls	TCO Certified	MSRP
ViewSonic 15G	15"/13.8"	0.28mm	1,280 x 1,024	Yes		\$425
ViewSonic 15GS	15"/14.0"	0.28mm	1,280 x 1,024	Yes	Yes	\$449
ViewSonic 15GA	15"/14.0"	0.27mm	1,280 x 1,024	Yes	Yes	\$499
ViewSonic 17GS	17"/16.0"	0.27mm	1,280 x 1,024	Yes	Yes	\$699
ViewSonic 17GA	17"/16.0"	0.27mm	1,280 x 1,024	Yes	Yes	\$799
ViewSonic GT770	17"/15.9"	0.25mm*	1,280 x 1,024	Yes		\$899
ViewSonic 20G	20"/18.4"	0.28mm	1,600 x 1,280		Yes	\$1,299
ViewSonic GT800	20"/19.1"	0.30mm*	1,600 x 1,280	Yes		\$1,899
ViewSonic G810	21"/20.0"	0.25mm	1,600 x 1,280	Yes		\$1,745

All monitors are EPA Energy Star™ and MPR-II certified. *Aperture Grille. Free VMA-1 Mac cable adapter available.

With high fidelity speakers integrated into the bezel for directed stereo sound, a built-in microphone*, headphone jack, as well as mute and volume controls, these *award-winning* monitors offer a unique experience in sight and sound.

The ultimate in high performance monitors, the ViewSonic GT770 and GT800 blend aperture grille mask technology and the vertically flat SonicTron™ screen to produce the sharpest, most brilliant colors from center to corner. The high contrast images are the richest and brightest available today.

Our monitors are backed by a limited 3-year warranty on CRT, parts and labor... the best in the business. Plus your company can take advantage of our special 48-hour Express Exchange™ Service option.



ViewSonic®

At ViewSonic, we make more than just good business monitors. We make good business sense.

Phone: (800) 888-8583 or (909) 869-7976; Agent Code 1256
Internet: <http://www.viewsonic.com>

*Optional microphone adapter may be required with certain Macintosh® systems. Prices and specifications subject to change without notice. Corporate names and trademarks stated herein are the property of their respective companies. © 1996 ViewSonic Corporation. All rights reserved.



A look at HTTP version 1.1, a necessary new Internet standard. By William Stallings

The Backbone of the Web

The Hypertext Transfer Protocol is the foundation protocol of the World Wide Web. The name is somewhat misleading. HTTP is not a protocol for transferring hypertext; it is a protocol for transmitting information with the efficiency necessary to make hypertext jumps. The data transferred by the protocol can be plain text, hypertext, audio, images, or any Internet-accessible information. Information in this article is based on the most recent (June 7, 1996) specification—HTTP 1.1, draft 05—which has been forwarded to the Internet Engineering Standards Group as a proposed standard.

HTTP is a transaction-oriented client/server protocol. To ensure reliability, HTTP uses TCP. Nevertheless, HTTP is a “stateless” protocol: It treats each transaction independently. A typical implementation will create a new TCP connection between client and server for each transaction, then terminate the connection as soon as the transaction completes. However, the specification does not require this one-to-one relationship between transaction and connection lifetimes; i.e., the connection can stay open so that more transactions can be made.

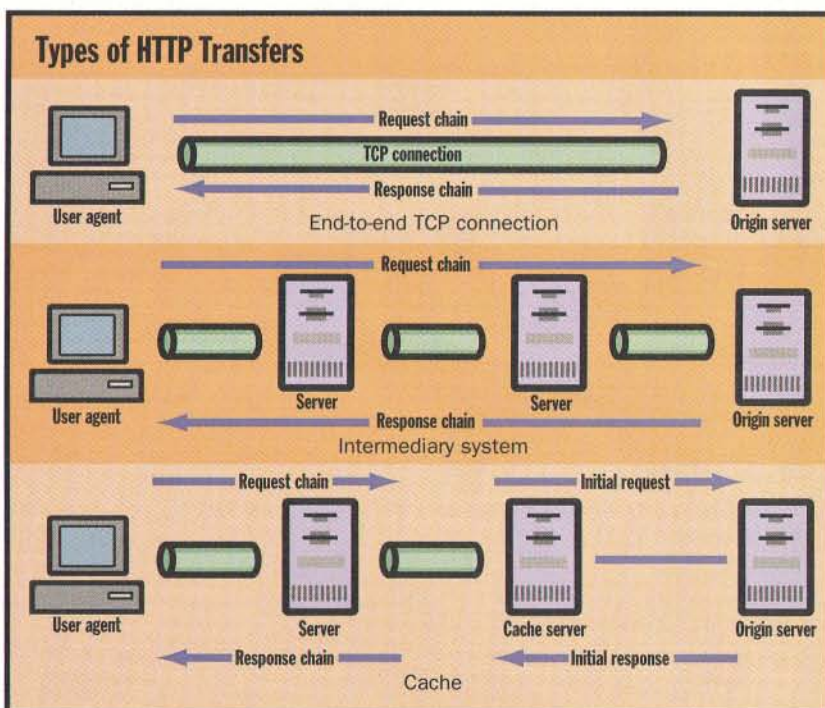
The stateless nature of HTTP is well-suited to its typical application. A normal Web session involves retrieving a sequence of pages and documents. The sequence is, ideally, performed rapidly, and the locations of the various pages and documents may be widely distributed among a number of servers, located across the country or around the globe.

The figure “Types of HTTP Transfers” illustrates three examples of HTTP operations. The user agent is the client, such as a Web browser, that initiates the request. The origin server is the server on which a resource resides; an example is a Web server where a desired home page

is located. The simplest case is one in which a user agent establishes a direct connection with an origin server. The client opens a TCP connection that is end-

response itself, and possible body content. The TCP connection is then closed.

The middle section of the figure shows a case in which there is not an end-to-end



HTTP supports operations via direct connection, intermediary systems, or a cache.

to-end between the client and the server. The client then issues an HTTP request. The request consists of a specific command (referred to as a *method*), a URL, and a message containing request parameters, information about the client, and perhaps additional content information.

When the server receives the request, it attempts to perform the requested action and then returns an HTTP response. The response includes status information, a success/error code, and a message containing information about the server, information about the

TCP connection between the user agent and the origin server. Instead, there are one or more intermediary systems with TCP connections between logically adjacent systems. Each intermediary system acts as a relay, so that a request initiated by the client is relayed through the intermediary systems to the server, and the response from the server is relayed back to the client.

The Machine in the Middle

The HTTP spec defines three forms of intermediary systems: proxy, gateway,

and tunnel (see the figure "Intermediary HTTP Systems"). A proxy acts on behalf of other clients and presents requests from other clients to a server. There are several scenarios that call for the use of a proxy. In one scenario, the proxy acts as an intermediary through a firewall. In this case, the server must authenticate itself to the firewall to set up a connection with the proxy. The proxy accepts responses after they have passed through the firewall. Another scenario involves handling different versions of HTTP. If the client and the server are running different versions of HTTP, then the proxy can implement both versions and perform the required mapping.

A gateway is a server that appears to the client as if it were an origin server. It acts on behalf of other servers that may not be able to communicate directly with a client. There are several scenarios in which servers can be used. As with the proxy, a gateway manages transfers through a firewall. In this case the client must authenticate itself to the proxy, which can then pass the request on to the server.

Another common scenario involves working with a non-HTTP server. Browsers have built into them the capability to contact servers that use protocols other than HTTP, such as FTP and Gopher servers. This multiprotocol capability can also be provided by a gateway.

A tunnel is simply a relay point between two TCP connections. HTTP messages are passed unchanged as if there were a single HTTP connection between user agent and origin server. Tunnels are used when there is an intermediary system between client and server, but it is not necessary for that system to understand the contents of messages.

Now let's take a look at another type of HTTP operation. A cache is a facility that stores previous requests and responses for handling new requests. If a new request arrives that uses the same stored request, then the cache can supply the stored response rather than access the resource indicated in the URL. The cache can operate on a client or on a server or on an intermediary system other than a tunnel. In the figure "Types of HTTP Transfers," a server has cached a request/response transaction, so a corresponding new request from the client need not travel the entire chain to the origin server; instead, the cache server handles it.

Not all transactions can be cached, and a client or a server can dictate that a certain transaction may be cached only for a given amount of time.

HTTP Messages

HTTP messages comprise two types: request and response. A request message is sent by an agent to a server to initiate some action. A response message is returned by a server to an agent in response to a request. Some possible actions are:

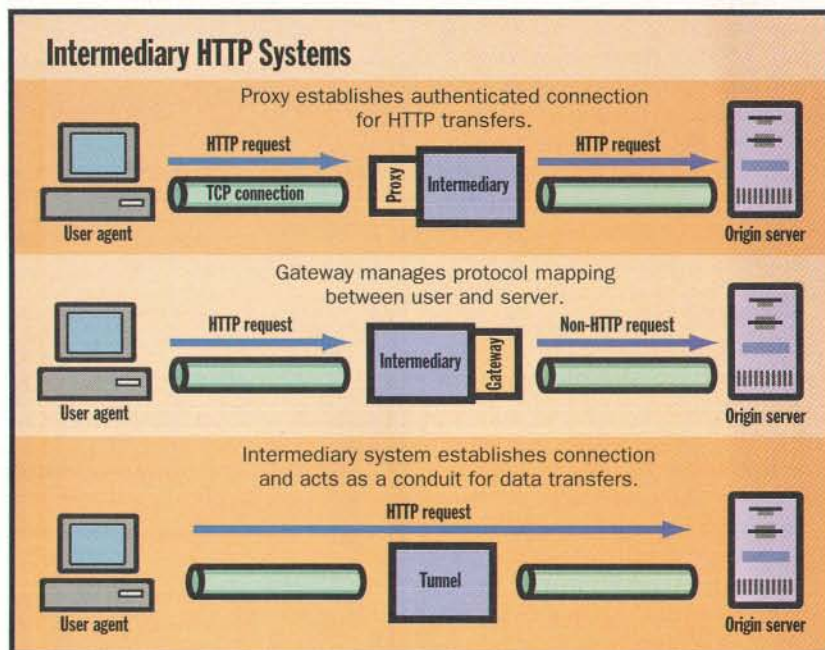
- GET: A request to retrieve information.
- POST: A request to accept the attached

received and processing continues. No entity body accompanies this response.

- Successful: The request was successfully received, understood, and accepted.
- Redirection: Further action is required to complete the request.
- Client error: Request contains a syntax error or request cannot be fulfilled.
- Server error: The server failed to fulfill an apparently valid request.

We Need This Standard

HTTP is the foundation of the World Wide Web. This request/response proto-



HTTP allows requests and responses to pass through disparate systems that build the network.

entity as a new subordinate to the identified URL.

• PUT: A request to accept the attached entity and store it under the supplied URL. This may be a new resource with a new URL, or it may be a replacement of the contents of an existing resource with an existing URL.

• DELETE: Requests that the origin server delete a resource.

A response message may include an entity body containing hypertext-based information. In addition, the response message must specify a status code, which indicates the action taken on the corresponding request. Status codes are organized into the following categories:

- Informational: The request has been

col used on top of TCP carries commands from browsers to servers and responses from servers back to browsers. As the explosive growth of the Web continues, and as new features are added to both browsers and servers, a standardized transfer protocol is essential to maintain the Web's growing functions and interoperability. HTTP provides the standardized definition required to meet these needs. **B**

William Stallings is a consultant and author of over a dozen books on data communications and networking. This article is based on material from his most recent book, Data and Computer Communications (Prentice-Hall, 1996). You can reach him at ws@shore.net.



Introducing the first handheld Windows PC that's tough enough for any occupation.



- 75MHz 486DX4 Processor
- 260MB Hard Drive
- Up to 32MB RAM
- 2 Type I, II, or III PCMCIA slots
- 1 Printer & 2 Serial ports
- Pen, Touch or Keyboard-based
- Temp: -10 to 50° C
- Shock: 20g (3-foot drop)
- Vibration: 2 G, 5-200 Hz
- Humidity: 5-95% R.H.
- Durocell Smart Battery
- Bundled: Windows, DOS, PenWindows

You know the mobile PCs you're used to? Mama's boys, all of 'em.

Especially with the birth of the new Hardbody™ Handheld PC—the first full-featured 486 PC made for people with really tough jobs.

The Hardbody goes places that make other mobile PCs whimper in fear. It can take a punch. It laughs at heat, sunlight, cold, dust and rain. It scoffs at proprietary systems. It goes looking for trouble.

Yet the 3-pound Hardbody Handheld PC is a full-featured PC

in every sense of the word. It runs off-the-shelf PC apps. It's completely networkable. And you can attach just about any piece of hardware or peripheral you'll ever need.

So if you've had your fill of cream-puff PCs, call Texas Micro or return the attached reply card today for more information, or to schedule a demonstration. And visit us at www.texmicro.com.



CALL TODAY 0031.36.536.5595

Circle 177 on Inquiry Card (RESELLERS: 178)

© 1996 Texas Microsystems, Inc., a division of Sequoia Systems. Hardbody is a trademark of Texas Microsystems, Inc. All other product names referenced are the property of their respective holders.



WANT A 486 UPGRADE THAT OUTPERFORMS INTEL?
FOR \$139 YOU CAN PUT KINGSTON INSIDE.



Making your 486 run like a Pentium® doesn't take magic. It just takes a TurboChip™ and a little pocket change. Instantly, you will have 5 x 86 clock-quadrupled technology that will help your system run three times faster. And the TurboChip has all the power you need to run today's demanding software, whether you have a 486-based DX2, DX, SX2, or SX system. So how does the TurboChip compare to Intel's OverDrive®? Not only does the TurboChip beat the OverDrive in price,

compatibility, and warranty, but in a recent study* it also outperformed it. The TurboChip is designed with AMD's Am 5 x 86-P75 CPU and upgrades with most IBM-compatible desktop systems. And since the TurboChip is a chip-for-chip replacement upgrade, it's easy to install. Plus it preserves your system configuration. To find your nearest Kingston® distributor call us at (800) 251-9059, domestically or (714) 437-3334 for international sales.

Kingston
TECHNOLOGY CORPORATION

For more information call us domestically at (800) 251-9059, or for international



sales call (714) 437-3334 or visit our Web site: <http://www.kingston.com/b.htm>



Circle 140 on Inquiry Card (RESELLERS: 141).

*Wintach test, Advanced Micro Devices, 1995. Kingston Technology Corporation, 17600 Newhope Street, Fountain Valley, CA 92708 USA, (714) 435-2600, Fax (714) 435-2699. © 1996 Kingston Technology Corporation. All rights reserved. Kingston is a registered trademark and Computing Without Limits and TurboChip are trademarks of Kingston Technology Corporation. All other registered trademarks are the property of their owners.

RISC powers Intel's intelligent I/O controller for servers. By Tom Thompson

The Server's Helper

The changing nature of information that office workers use has had an impact on the role the network server plays. Today's server must pump out digital video, audio, and 3-D graphics on demand; handle complex database queries; and manage Web transactions. As a consequence, a server requires a more efficient architecture than just a souped-up desktop-computer design. A faster processor and system bus aren't enough. The computer must manage the vast amounts of I/O this type of data demands. Radical architectures from Tandem and Sequent address this problem on high-end server designs, as described in "The Network in the Server" (July BYTE).

Moderate-size servers must also work with the same type of data, on a smaller scale. When it comes to handling I/O, such servers must work smarter, not harder. Even a multiprocessor server can grind to a halt if each processor is supervising a peripheral or—worse—waiting to access a congested system bus.

To this end, Intel just started sampling the i960 RP, a 32-bit RISC processor that functions as an intelligent I/O controller. It supports DMA transfers, address translation, various memory types, and multiprocessor interrupt control. Thus, it can manage most of a server's peripheral I/O traffic without CPU intervention, eliminating many throughput bottlenecks.

The i960 RP also acts as a PCI-to-PCI bridge unit, which lets you add more slots to the design. At the same time, the bridge unit reduces the number of components required to build a server that uses state-of-the-art high-speed PCI peripherals. This enables a server to provide high throughput yet remain affordable.

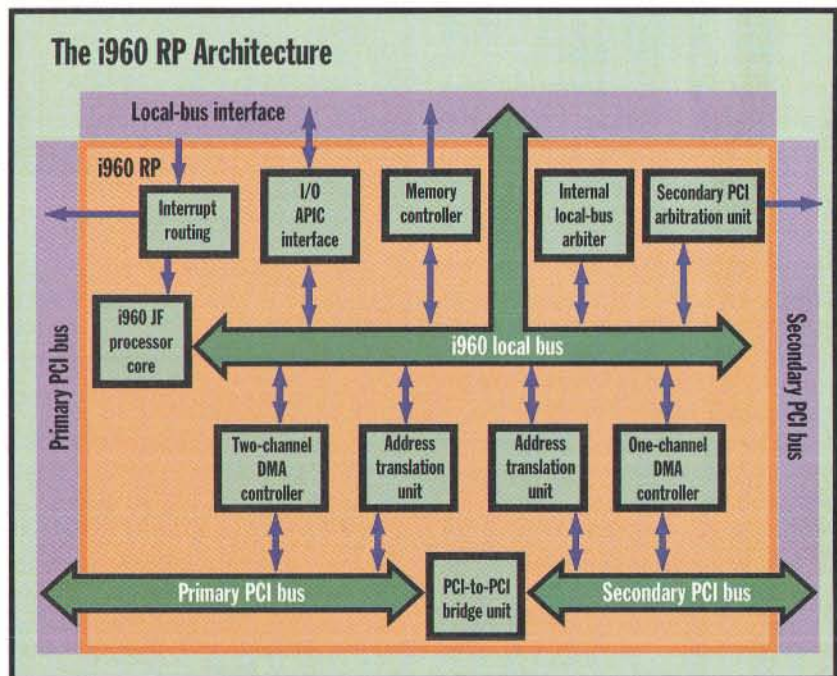
RISC at the Core

Like other chip vendors' smart I/O processors, Intel took the core of its tried-

and-true i960 JF embedded processor and wrapped I/O support logic around it. Our tour of the processor begins with this RISC core. The i960 JF core consists of 32 32-bit registers. Sixteen of them are local (general-purpose); the other sixteen are global registers used for parameter passing or storing critical variables. An on-

chip local-register cache stores up to eight copies of the local registers. This provides hardware support for the rapid entry and exit of function calls, a useful feature for time-critical interrupt handlers.

The core includes a 4-KB two-way set-associative instruction cache, a 1-KB



This intelligent I/O controller manages DMA transfers and memory timing. It also acts as a PCI-to-PCI bridge.

chip local-register cache stores up to eight copies of the local registers. This provides hardware support for the rapid entry and exit of function calls, a useful feature for time-critical interrupt handlers.

The core consists of 700,000 transistors and has a four-stage pipeline. It has several independent execution units (EUs): one for instruction processing and address generation, a multiply-divide unit (MDU) for 32-bit math computa-

direct-mapped data cache, and 1 KB of on-chip data RAM. You can enhance interrupt processing by locking sections of interrupt-handler code within the instruction cache and by storing a number of interrupt vectors in the on-chip memory. At 33 MHz, the core delivers 31 VAX MIPS.

A bus-control unit (BCU) supports 8-, 16-, and 32-bit memory addressing, plus big-endian and little-endian addressing

modes. This lets the i960 connect to a large variety of memory and peripherals. Up to eight sections of memory, each 512 MB in length, can be defined with different memory-width attributes. Regions of memory ranging in size from 4 KB to 4 GB can also be defined as cacheable (typically for program memory) and noncacheable (typically for I/O devices).

Device Interfaces

The i960 RP provides a wealth of device interfaces and control functions, such as a memory controller, DMA controller, and PCI-to-PCI bridge unit, as shown in the figure "The i960 RP Architecture." These features can be used to both simplify a server design and improve system throughput.

The built-in memory controller generates the appropriate timing and signals for three different RAM types: fast page-mode (FPM), extended data out (EDO), and burst extended data out (BEDO). The controller supports memory interleaving for FPM RAM. The controller also handles 8- or 32-bit-wide ROM, static-RAM (SRAM), and flash-memory devices.

The i960's integrated DMA controller has three DMA channels that perform high-speed transfers between PCI peripherals and local memory (i.e., memory directly managed by the memory controller). Each DMA channel has a hardware packing and unpacking unit that can handle unaligned data transfers.

The DMA controller also implements *chain descriptors*. A chain descriptor is a data block that describes a DMA transfer, such as the amount of data to move, the source and destination addresses, a control value, and a pointer to the next descriptor. The pointers let you link descriptors into a "chain" of operations that can gather scattered blocks of data and transfer them in one chunk to the destination. These chains can implement sophisticated data transfers, perhaps moving data from a hard drive into memory and then to a network device, as shown in the figure "An Intelligent I/O Operation." Such a chain can supervise this type of complex transfer without

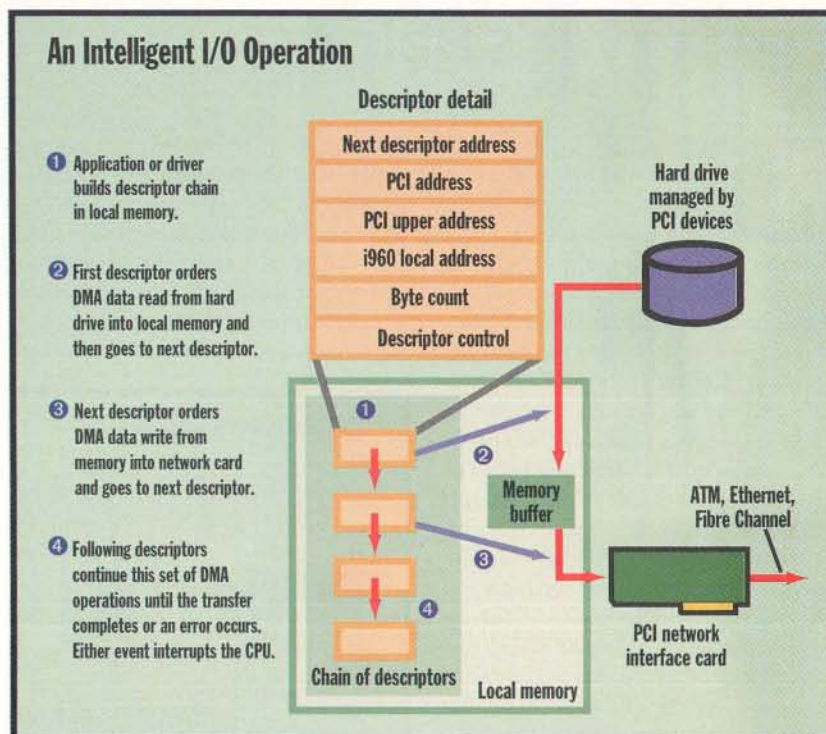
interrupting the host processor, unless an error occurs.

A Built-In Bridge

The most versatile feature of the i960 RP is its PCI-to-PCI bridging capability. It supports two PCI buses: a primary PCI bus, which connects to the host CPU, and a

data to an Ethernet interface, and both these PCI-based devices reside on the PCI secondary bus. The bridge logic blocks these transfers from the primary PCI bus, so that it can independently handle a different set of I/O operations.

The DMA controller works in tandem with the PCI-to-PCI bridge unit to boost



Sequences of DMA commands can manage complex I/O transfers without CPU support.

secondary PCI bus that's maintained by the i960. These interfaces let you add the i960 to a PCI-based server design without using additional glue logic. This secondary bus complies with the 5-V PCI standard, and at 33 MHz, it provides nine extra PCI loads. This lets the server design offer more PCI devices or card slots. You can attach additional i960 RP processors to the secondary bus to build a hierarchy of PCI buses, so that the system can handle a large number of network interfaces and storage devices.

The i960's PCI bridge logic can forward memory, I/O, and command transfers between the two PCI buses. However, you can program the bridge logic to "filter" certain PCI transactions. This reduces traffic in other buses on the server and aids in the implementation of intelligent I/O subsystems. For example, suppose a hard drive is streaming video

throughput. Also, properly written descriptor chains can add smarts to low-cost PCI peripherals, so that their use improves performance while minimizing CPU overhead.

As you can see, the i960 RP offers many capabilities to a server design. Certain functions, such as the DMA controller, allow the systems designer to hand off data transfers between memory and peripherals to the i960, thus relieving the server's CPUs of this chore. Other functions, such as the memory controller and the PCI-to-PCI bridging capability, allow the engineer to eliminate some parts from the design, thus reducing the server's cost and complexity. **B**

WHERE TO FIND

Intel Corp.
Santa Clara, CA
(800) 628-8686
fax: (503) 264-6835
<http://www.intel.com/DESIGN/IIO>

Tom Thompson is a BYTE senior technical editor at large. He has a B.S.E.E. degree from the University of Memphis. You can reach him on the Internet at tom_thompson@bix.com.

Removable one-gig disks,
unlimited space,
fast as a hard drive.

For the nearest dealer, call:
888-2-IOMEGA, ext. j22
Or see us at: www.iomega.com



The Jaz™ drive is you, man. It's fast, it holds tons of stuff, and it's personal. You won't find an easier or cooler way to upgrade your hard drive. Just connect it to your PC or Mac and you're jammin': files, pictures, graphics, video, CAD stuff, whatever. And with its dark green color, hey, the cat's got style.

That's a jammin' gig.

jaz



The Unlimited Personal Hard Drive.

Endless storage space.
Load and edit projects instantly.
Goes anywhere you go.



1GB disks for as low as \$99.95.

Compact one-gigabyte cartridges.
Great for graphics, sound, and video.
Portable files. Fast, easy backup.

BECAUSE IT'S YOUR STUFF.™



MORE DEVELOPERS PROTECT.



See Us At
Software Development Expo
October 29-31
Washington, DC



HASP Packs More Into Less.

Based on a full-custom ASIC utilizing 2500-gate, 1.5-micron E² technology, HASP packs the most advanced protection into the smallest key in the world.

HASP[®] PROTECTS MORE.

NSTL Study Rates HASP No. 1!



A recent test conducted by the National Software Testing Labs, the world's foremost independent lab, compared the flagship products of leading software protection vendors.* The result? HASP was rated the clear overall winner - and number one in all the major comparison categories.

NSTL TEST RESULTS, OCTOBER 1995†

Scoring Category	Aladdin HASP	Rainbow Sentinel
Security	9.3	6.3
Ease of Learning	9.1	7.1
Ease of Use	8.3	7.2
Versatility/Features	10	8.7
Compatibility	6.7	6.5
Speed of API Calls	0.9	1.2
Final Score	8.5	6.5

*For a full copy of the NSTL report, contact your local HASP distributor.

These days, more and more developers are choosing to protect their software against piracy. They're protecting more products, on more platforms, with better protection – and selling more as a result.

And more of these developers are protecting with HASP. Why? Because HASP offers more security, more reliability and more features than any other product on the market.

HASP supports the most advanced platforms, including all Windows 32/16-bit environments, OS/2, DOS, Mac, Power Mac, NEC, UNIX and IANs.

To learn more about how you can protect better – and sell more – call now to order your HASP Developer's Kit.

Grow With Aladdin!

The fastest growing company in the industry, with over 4 million keys sold to 20 thousand developers worldwide, Aladdin is setting the standard for software security today.



North America Aladdin Knowledge Systems Inc. Tel: (800) 223 4277, 212-564 5678, Fax: 212-564 3377, E-mail: hasp.sales@us.aks.com
Int'l Office Aladdin Knowledge Systems Ltd. Tel: +972-3-636 2222, Fax: +972-3-537 5796, E-mail: hasp.sales@aks.com
Germany FAST Software Security AG Tel: +49 89 89 42 21-37, Fax: +49 89 89 42 21-40, E-mail: info@fast-ag.de
United Kingdom Aladdin Knowledge Systems UK Ltd. Tel: +44 1753-622266, Fax: +44 1753-622262, E-mail: sales@aldn.co.uk
Japan Aladdin Japan Co., Ltd. Tel: +81 426-60 7191, Fax: +81 426-60 7194, E-mail: sales@aladdin.co.jp
Benelux Aladdin Software Security Benelux B.V. Tel: +31 24-641 9777, Fax: +31 24-645 1981, E-mail: 100526.1356@compuserve.com

Aladdin Russia 095 9230588 ■ Australia Conlab 03 98965685 ■ Chile Micrologica 02 2221386 ■ China Shanghai LRI 021 64377828 ■ Czech Atlas 02 766085 ■ Denmark Berendsen 039 577316 ■ Egypt Zeinlein 02 3604632 ■ Finland ID-Systeme 0 8703520 ■ France 1 40869885 ■ Greece Unibrain 01 6756320 ■ Hong Kong Hastings 02 5484629 ■ India Solution 011 2148254 ■ Italy Partner Data 02 26147380 ■ Korea Dae-A 02 8484451 ■ Mexico Sisoft 5 2087472 ■ New Zealand Training 04 5666014 ■ Poland Synterm 061 480273 ■ Portugal Futurmatica 01 4116269 ■ Romania Ro Interactive 064 140283 ■ Singapore ITR 065 5666788 ■ South Africa D Le Roux 011 8864704 ■ Spain PC Hardware 03 4493193 ■ Switzerland Opeq 061 7169222 ■ Taiwan Tecco 02 5559676 ■ Turkey Mikrobeta 0312 4670635 ■ Yugoslavia Ays 021 623920

© Aladdin Knowledge Systems Ltd. 1995-1996. ® HASP[®] is a registered trademark of Aladdin Knowledge Systems Ltd. All other product names are trademarks of their respective owners. Mac & the Mac OS logo are trademarks of Apple Computer, Inc., used under license. NSTL makes no recommendation or endorsement of any product. †The NSTL report was commissioned by Aladdin.

Add an interactive database to your Web pages with a few simple tools. By Rick Dobson

Make Access and the Web Work Together

Perhaps you've seen one of those cool Web pages where you type in a request to obtain up-to-the-minute product information. Microsoft's Internet Information Server (IIS), with its Internet Database Connector (IDC), simplifies the process of building dynamic Hypertext Markup Language (HTML) pages so that you can add such a mechanism into your Web pages. This lets you develop and maintain intranet and Internet Web sites that allow the interactive search, display, and modification of information in a Microsoft Access database.

It's important to note that such applications can support only low to intermediate hit rates. However, it's easy to upsize them to full-blown SQL Server applications. Thus, Access shines as a rapid prototyping tool for building frequently visited Internet sites.

This approach requires three items. First, Web-site visitors must have Web browsers. Second, the IIS/IDC must be running on the server. The IDC is a DLL named HTTPODBC.DLL. Third, you must install the Access 7 for Windows 95 Open Database Connectivity (ODBC) driver on the server. The IDC requires such a "thread-safe" ODBC driver so that multiple clients can launch concurrent queries against the same data source.

Dynamic Access Parts

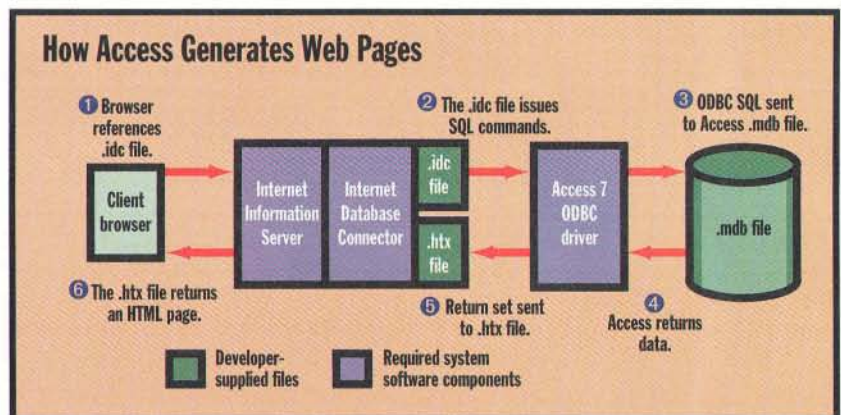
The Web browser handles any user events and typed input, and it displays the information returned by the database. An .mdb file stores the tables, forms, queries, and modules that comprise your Access database. Two key developer-designed files on the IIS manage the interactive process, as shown in the figure "How Access Generates Web Pages." The .idc file defines specific valid data fields and operations; the .htx file formats the returned data for display by the client browser.

The key field in an .idc file is SQL-Statement. It lets you perform all the functions permitted by Access's SQL. Two other required fields are Datasource and Template. Datasource ultimately points the query embedded in SQL-Statement to the appropriate .mdb file. Finally, Template names the .htx file that's responsible for formatting the result.

cial tags for processing the query results returned by the ODBC driver. These vendor-specific tags, in conjunction with traditional HTML tags, let developers control what a client browser views.

A Sample Program

I constructed a simple database application based on the Northwind database sample that ships with Access. My test



The developer provides several files to create an interactive database connection on the Web.

You can include several optional fields that refine your application's behavior. MaxRecords designates the maximum number of records a query returns. With DefaultParameters, you can supply default criteria for a query when the client fails to do so. Use Required Parameters instead to generate an error when the client browser does not provide a parameter. Username and Password act as a gateway to security features. These fields, in conjunction with Access's users, groups, and permissions features, can restrict admittance to tables with sensitive data, such as salaries.

The .htx file is a template for the HTML file passed back to the client Web browser from the IIS. The .htx file includes spec-

database includes two tables. The first, tblCustomers, contains the CustomerID, CompanyName, ContactName, and Phone fields. The second, tblSalesByCustomer, houses the CustomerID and Sum fields. Sum contains the total sales for each customer.

My initial .idc file (shown in the listing "Query Input and Control" on page 72) creates a listing of the top 10 customers ranked by sales in descending order. This file contains four fields. The first one, Datasource, points to the target .mdb file, as routed through an ODBC data source. The ODBC-driver dialog box has a New button that allows the developer to create the data source that points to the .mdb file. However, Datasource

eliminates this bit of manual intervention for the user, which is necessary to support a self-contained Web site.

The second field, `Template`, names an .htx file that serves as a template for formatting the HTML page to appear on the client's browser. The third field, `MaxRecords`, restricts the lists of returned records to 10. Finally, `SQLStatement`

ular query, bracket its name inside these vendor-specific tags (e.g., `<%Sum%>`). The IIS repeatedly merges all .idc fields between `<%BeginDetail%>` and `<%EndDetail%>` for each record in the return data set.

You create drill-down hyperlinks to other pages by use of HTML anchor tags. You do this by placing another .idc file-

The term that's on the right of the equal sign references the value in the current hyperlink.

The listing "Data Close Up" shows the .idc and .htx files that generate the drill-down page from the top 10 CustomerID displays. This .idc file extracts the company and contact names along with the phone number for the CustomerID that matches the one in the hyperlink jump. It accepts a passed argument with an expression such as `CustomerID=%CustomerID%` in the `Where` clause of its `SQLStatement`. The term on the left of the equal sign corresponds to a field in the `Select` list of the query. The term on the right of the equal sign represents the passed parameter. Its value is set by the calling hyperlink jump.

The .htx file in the listing "Data Close Up" demonstrates some basic HTML tag techniques for controlling the display of records returned by an .idc file. Its corresponding .idc file returns a single record with four fields. The `BR` tag positions each field on a different line. The other tags adjust the font and the position of the results.

Closing Issues

The IIS/IDC plus Access provides a quick, easy way to start publishing dynamic HTML pages from a database. Many more options beyond those in the code listings are feasible. For example, you can populate combo boxes on HTML forms, or you can accept values directly from HTML forms for selecting or updating an Access database.

I found the new functionality easy to use, but experienced Access developers will appreciate enhancements. First, Access developers are used to more flexibility in processing return sets than the .htx file permits. Among the features missing are event programming and expressions. Second, no error-trapping techniques are available with this release. While errors do not cause the system to abruptly halt without user recovery, you can still be confronted with error messages that may not be meaningful. Third, wizards and more graphical development aids would help promote the acceptance of this Web development strategy among Access developers. **B**

Rick Dobson is president of CAB, Inc., a database and Internet consultancy. You can reach him at Rick_Dobson@msn.com.

Query Input and Control

```
.idc file that shows top 10
customers
Datasource: WebSales
Template:
SalesByCustomer.htx
MaxRecords: 10
SQLStatement:
+ SELECT CustomerID, Sum
+ FROM tblSalesByCustomer
+ ORDER BY Sum DESC
```

```
.htx file to display
customers and sales
<HTML>
<HEAD>
<TITLE>Drill-Down
List</TITLE>
</HEAD>
<BODY>
<FONT FACE=ARIAL SIZE="2">
<UL>
<%BeginDetail%>
<LI><A HREF
="/Byte/CustomerDetail.idc?C
ustomerID=<%CustomerID%>">
Customer ID:
<%CustomerID%></A>,
<%Sum%><BR>
<%EndDetail%>
</UL>
</BODY>
</FONT>
</HTML>
```

Data Close Up

```
.idc file that drills down to
detail a particular customer
Datasource: WebSales
Template: CustomerDetail.htx
SQLStatement:
+ SELECT CustomerID,
CompanyName,
+ ContactName, Phone
+ FROM tblCustomers
+ Where
CustomerID=%CustomerID%
```

```
.htx file that displays a par-
ticular customer
<HTML>
<HEAD>
<TITLE>Customer Contact
Detail</TITLE>
</HEAD>
<BODY>
<%BeginDetail%>
<FONT SIZE="4">
Here is the contact informa-
tion for CustomerID:
<%CustomerID%><BR>
<P>
<FONT SIZE="3">
CompanyName:
<%CompanyName%><BR>
ContactName:
<%ContactName%><BR>
Phone: <%Phone%><BR>
<%EndDetail%>
</BODY>
</FONT>
</HTML>
```

Pairs of .idc/.htx files that implement an Access database query for the top 10 customers and display the results.

includes the SQL string that controls the query. Each line, including the first one, must begin with a plus sign.

An .htx file can contain all the graphic files and formatting touches that regularly adorn the HTML pages at your favorite Web sites. The .htx file displays the query results within a pair of `<%BeginDetail%>` and `<%EndDetail%>` vendor-specific tags. To display a partic-

ular name between the anchor tags, which in turn creates a drill-down page. A question mark must follow the .idc filename. This is demonstrated in the first listing's .htx file. When you need to pass a parameter to the second .idc file, insert a phrase such as `CustomerID=<%CustomerID%>` after the .idc filename. The left term, `CustomerID`, designates a field in `SQLStatement` for the second .idc file.

FREE Disk!

Introducing bulletproof glass for Windows™ NT networks

☐ **YES!** I'm interested in trading up a competitive or older UPS to a Smart-UPS. Please send Trade-UPS info.

☐ **No**, But I would like a FREE ☐ Handbook* ☐ Demo Disk*



"an excellent piece of management software."
-Windows NT Magazine, Editor's Choice*

Name: _____ Title: _____
Address: _____
City: _____ State: _____ Zip: _____
Phone: _____ Fax: _____
E-Mail Address: _____
Brands of UPS used? _____

☐ Reseller ☐ End User Please fill in all information completely for prompt service



APC
AMERICAN POWER CONVERSION
(800)800-4APC
Dept A2

* Allow 4 - 6 weeks for delivery.

©1996 APC. All Rights Reserved. Smart-UPS and Trade-UPS are trademarks of American Power Conversion. All other trademarks are property of their respective owners. 001002

UPS self test

Unattended scheduled self tests provide peace of mind

Min./Max. power line voltage

Useful in diagnosing system problems

UPS

temperature

Monitoring for proper UPS temperature to extend battery life



"an excellent piece of management software."
-Windows NT Magazine, Editor's Choice



According to Microsoft, "A UPS is an important part of any deployment of Windows NT systems..." Fortunately, APC provides the most comprehensive protection against the single largest cause of NT data loss—power problems. APC's PowerChute® plus for Windows NT and APC Smart-UPS combine to give you the power management features necessary to make SURE you're protected.

- Shut down system safely-graceful, unattended shutdown of Win NT & SMS Servers. Through scheduled shutdowns you can even cut energy costs by up to 76%.
- UPS testing/status-assures that system administrators are informed of power problems before they impact system integrity.

- Remote UPS management-eliminates the need to send trained personnel to remote sites to configure UPS parameters, reboot servers or diagnose power problems.
- Environmental/power monitoring-allows you to quickly diagnose power problems and thus decrease network downtime without the expense of an electrician. PowerChute plus also provides:
 - NEW FlexEvents-Want to be paged or have an E-Mail sent to you if there is a power problem? FlexEvents allows you to specify these and other customizable UPS reactions to power events.
 - Systems Management Servers UPS MIF Support permits asset management of UPS systems.

"The Smart-UPS not only cuts the leading edge of power protection, its PowerChute plus software also delivers full management and control...[with] the best combination...of new and innovative features." -Network Computing



1990, 1991, 1992, 1993, 1994



FREE DEMO DISK
or 60 Page Catalog!
or download from our NEW PowerPage™
<http://www.apcc.com>
Click on "Free Stuff"

SURGEARREST™ & PROTECTNET™
AC and data line surge suppressors



STARTING AT \$19

BACK-UPS® & BACK-UPS® PRO
UPS for PC and advanced workstations



STARTING AT \$119

SMART-UPS® & SMART-UPS® V/S
Manageable UPS for servers and networks



STARTING AT \$299

MATRIX-UPS™ & ACCESSORIES
Modular UPS for client/server datacenters



STARTING AT \$3499

APC

AMERICAN POWER CONVERSION

800-800-4APC

Dept. A2

Germany-(+49)89 958 235
France-(+33)05.39.32.03
UK-(+44)753 511022
India-(+91) 44 434 1784

Japan-(+81)03 3798 3888
Russia-(+7)095 929 9095
China-(+86) (10) 7638917

WHEN YOU NEED THE POWER OF A DESKTOP AT 30,000 FEET, MICRON HAS YOU COVERED.

With up to eight hours' battery life* and full multimedia desktop performance, the **Millennia TransPort™** puts compact, no-compromise computing where you need it.



Modular Bay #1

Modular Bay #2



8X CD-ROM



Second
hard drive



3.5" floppy drive



Second lithium-
ion battery

With its exclusive FlexOpt™ dual bay modular design, the **Micron Millennia TransPort™** lets you mix and match devices for a variety of customized choices. Drop in a modular CD-ROM drive to enhance multimedia capability. Add a second intelligent modular lithium-ion battery for up to eight hours' use without recharging*, or add a second 2.0GB hard drive to more than double your storage capacity. And there's additional built-in flexibility with features like Micron's innovative Pick-a-Point™ system offering touchpad or pointing-stick operation and an infrared port for wireless printing from compatible printers. Top it off with our industry-leading Micron PowerSM warranty and you have the ideal portable computing solution.



AUGUST 1996
MILLENNIA TRANSPORT P133

Already a winner of two *PC Magazine* Editors' Choice awards for Millennia™ products, Micron just won a third with our Millennia TransPort™ in the August 1996 edition of *PC Magazine*.



Micron Power™ Warranty & Support

- 5-year limited warranty on microprocessor and main memory
- 3-year limited parts-only system warranty
- 1-, 2- or 3-year optional on-site service agreement for Micron desktop systems
- 30 days of free Micron-supplied software support for Micron desktop systems
- 30-day money-back policy
- 24-hour technical support

The foregoing is subject to and qualified by Micron's standard limited warranties and terms and conditions of sale. Terms and conditions of sale may vary for specific configurations. Copies of the limited warranties may be obtained on our Web site or by calling Micron.

*Actual battery performance will vary depending on applications and configurations. Based on two 4-hour batteries.



Millennia TransPort™ P133

- 16MB EDO memory (48MB max.)
- 12.1" active matrix color display, 800 x 600
- 1.2GB removable hard drive

\$4,399

Business lease \$150/month

- 32MB EDO memory (48MB max.)
- Motorola® Montana 28.8 fax/modem
- 12.1" active matrix color display, 800 x 600
- 1.2GB removable hard drive
- 2nd lithium-ion battery

\$5,199

Business lease \$163/month

Options:

- With 150MHz Pentium processor add \$200
- With 2nd 1.2GB removable hard drive add \$599
- With 2nd 2.0GB removable hard drive add \$699
- With 16MB DIMM module upgrade add \$349
- With 3Com® IDBT PCMCIA add \$149



Tollfree from Canada
800-708-1758



Tollfree from Mexico
95-800-708-1755



Tollfree from Puerto Rico
800-708-1756

International Sales
208-893-8970



International Fax
208-893-7393

900 E. Karcher Road, Nampa, ID 83687 • Mon-Fri 6am-10pm Sat 7am-5pm (MT) International Sales Hours: Mon-Fri 6am-7pm (MT)
208-893-3434 • Fax 208-893-3424 • Purchase Order Fax 208-893-8992 • Technical Support Available 24 Hours / 7 Days
Technical Support E-mail: techsupport.mei@micron.com

©1996 Micron Electronics, Inc. All rights reserved. Micron Electronics is not responsible for omissions or errors in typography or photography. All purchases are subject to availability. Prices and specifications may be changed without notice; prices do not include shipping and handling. 30-day money-back policy does not include return freight and original shipping/handling charges, applies only to Micron brand products and begins from date of shipment. All sales are subject to Micron Electronics' current terms and conditions of sale. Lease prices based on 36-month lease. Intel, Intel Inside and Pentium are registered trademarks of the Intel Corporation. Microsoft, Windows the Windows logo and Windows NT are registered trademarks of Microsoft Corporation. All other service marks, trademarks and registered trademarks are the property of their respective companies. BYTE-TRANS-9610

Circle 169 on Inquiry Card.

Standard Features

- 133MHz Mobile Intel Pentium® processor
- Intel 430MX PCI chipset
- 256KB L2 pipeline burst cache
- 16MB EDO memory (48MB max.)
- 8X modular CD-ROM drive
- PCI graphics accelerator, 1MB EDO memory
- Pick-a-Point™ dual pointing devices integrate both pointing stick and touchpad
- Removable EIDE hard drive (1.2GB max.)
- 3.5" modular floppy drive
- Intelligent modular lithium-ion battery
- 16-bit stereo sound
- Built-in stereo speakers and microphone
- 2 Type II or one Type III PCMCIA slots
- S-Video and NTSC video outputs
- Headphone, microphone and line-in jacks
- 2 infrared ports: one front, one back
- Parallel, serial, VGA and 2 PS/2 ports
- Dimensions: 11.7" x 9.4" x 2.0", Weight: 6.9 lbs.†
- Nylon carrying case
- Microsoft® Windows® 95 and MS® Plus! CD
- Microsoft Office Pro 95 and Bookshelf® 95 CDs
- Kensington™ security lock‡
- 5-year/3-year Micron PowerSM limited warranty*

† 6.9 lbs. includes 3.5" floppy and one battery

‡ Lock secures both Millennia TransPort and MicronDock™



Designed for



Microsoft®
Windows®95



APRIL 1996

MICRON™
ELECTRONICS, INC.

800-723-2998
<http://www.mei.micron.com>

3-D for EVERYONE

Seeing isn't believing: 3-D must face growing pains before it can become essential for business applications.

By Udo Flohr

Now that low-cost 3-D is reaching our desktops at little or no extra cost, cynics might respond with a resounding, "So what?" They counter that, unless you're hooked on shoot-'em-up games, low-cost 3-D is just another check-off item from board vendors vying for your business.

But proponents counter that 3-D's potential for general-purpose computing is wide open. Just as GUIs and the mouse changed the face of computing during the past decade, 3-D will bring about new ways of viewing and analyzing data.

Timing puts the truth somewhere between these two opposing views. Innovators at places such as Xerox's Palo Alto Research Center (PARC) are already showing early software designs that use 3-D to add layers of information to databases and interfaces, making today's 2-D software look Spartan by comparison. But commercial versions of these products are at least a year or two from widespread use.

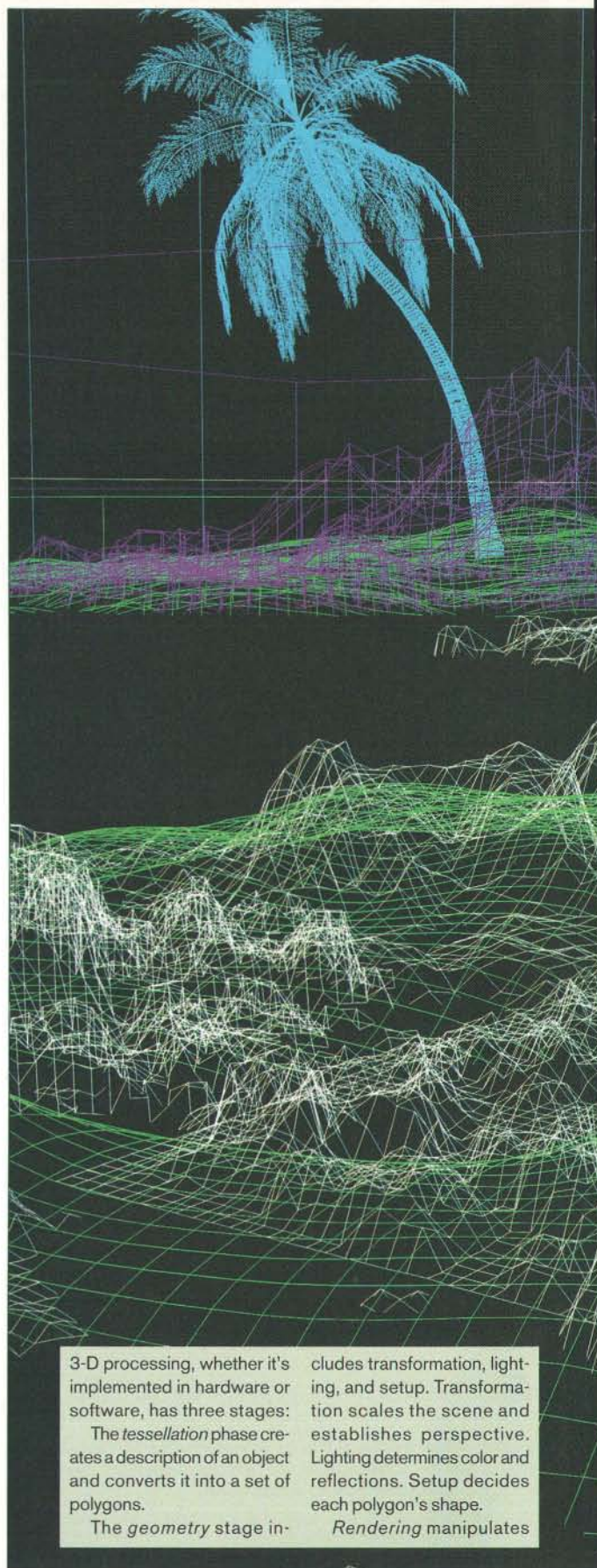
In the meantime, buyers beware: Not all the chips, boards, and APIs that spawned this year's crop of low-cost 3-D products will have the ability to run tomorrow's applications. To keep their designs affordable, vendors of low-end 3-D products made some compromises. As a result, some game-optimized chips cannot provide the processing power that professional-level 3-D accelerators now deliver for simulations and CAD applications.

The bottom line is that today's low-cost 3-D world is neither insignificant nor fully formed. This situation forces us to look beyond the glittering graphics to make judicious choices about 3-D.

Real 3-D

How might 3-D eventually change the way in which we work? The first phase of mass-market 3-D products will bring traditional 3-D applications, such as architectural walk-throughs, virtual reality, animation, and state-of-the-art games, to mainstream desktops. Next we'll see 3-D applied to standard applications, such as graphics editors, spreadsheets, and even word processors.

continued



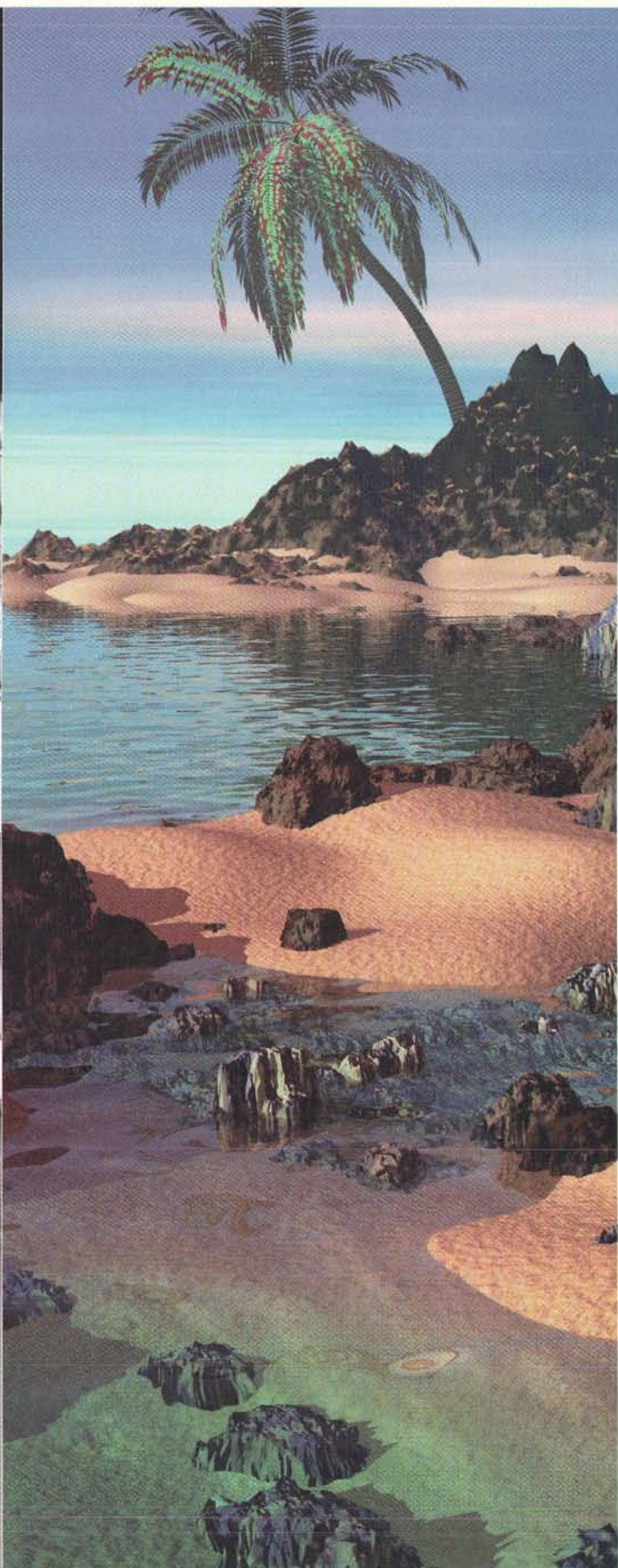
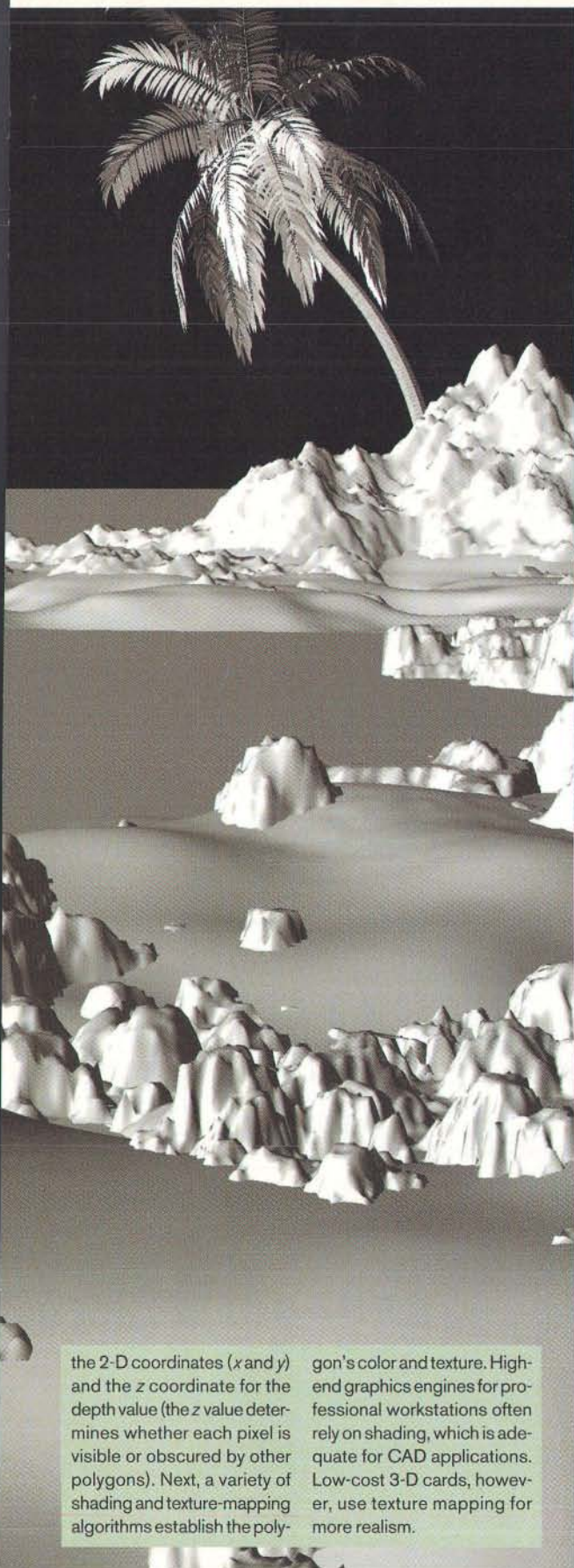
3-D processing, whether it's implemented in hardware or software, has three stages:

The *tessellation* phase creates a description of an object and converts it into a set of polygons.

The *geometry* stage in-

cludes transformation, lighting, and setup. Transformation scales the scene and establishes perspective. Lighting determines color and reflections. Setup decides each polygon's shape.

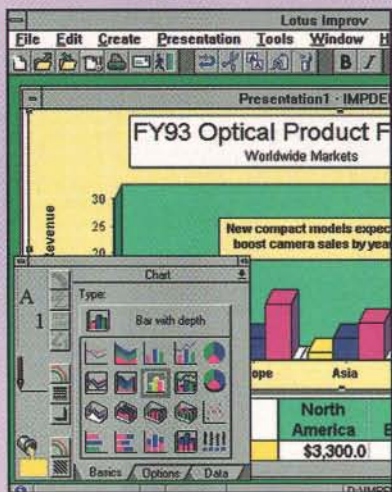
Rendering manipulates



the 2-D coordinates (x and y) and the z coordinate for the depth value (the z value determines whether each pixel is visible or obscured by other polygons). Next, a variety of shading and texture-mapping algorithms establish the poly-

gon's color and texture. High-end graphics engines for professional workstations often rely on shading, which is adequate for CAD applications. Low-cost 3-D cards, however, use texture mapping for more realism.

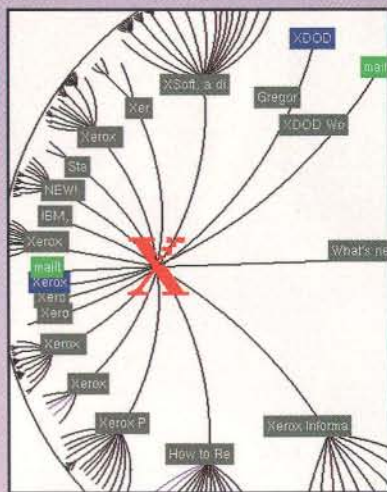
3-D Evolution



In the past, spreadsheets used visual tricks to simulate the 3-D experience. But you actually saw and manipulated data in 2-D space.



Competition is prompting games developers to actively devote resources to 3-D and to wade through problems caused by still-evolving API standards.



This hyperbolic view of a Web site, created at Xerox PARC, lets you browse a graphical map. It could be adapted for the 3-D browsing of hierarchical data structures.

To see the 3-D possibilities for general business applications, consider the advanced spreadsheets and databases that already work in three dimensions. Today you can populate a structural cube with data and then slice and dice it horizontally, vertically, or across a 3-D plane.

For instance, you might set up a 3-D spreadsheet to hold a year's worth of sales data, with each 2-D sheet listing the sales of a number of products for one month. Each layer of the spreadsheet holds information for a different month. To view the annual sales of a single product, you simply cut across the cube to retrieve the product's data for all 12 months.

The problem with this approach lies in viewing such a data cube on a flat surface. Once you cut across the cube, today's 3-D spreadsheets simply build a new 2-D view. Developers have tried to simulate the 3-D experience by adding slick interface tricks, such as drilling down on data by double-clicking on a functional heading or displaying the data within complicated 2-D matrices.

But in the end, 3-D spreadsheets have not met their potential because of the inherent weaknesses of working with 3-D data in 2-D space. In a true 3-D environment, you will be able to not only build a data cube but also rotate the cube in 3-D space and arrange the data in enlightening new ways.

Before that happens, we may see many examples of gratuitous 3-D. Developers and marketing wizards will concoct spinning logos and other graphical gimmicks, eye-catchers with little or no real value. But user-interface (UI) design is evolving to grasp 3-D's potential and turn it into something useful.

Whether or not software developers quickly turn 3-D into something that is useful for business applications, there is no doubt that ubiquitous 3-D is on the way. Consider Intel's MMX technology. MMX adds 57 new instructions to the x86 instruction set to accelerate multimedia applications, such as 3-D and 2-D graphics, video, audio, speech synthesis and recognition, and communications. According to Intel's simulations, we can expect to see performance boosts of between 50 percent and 100 percent.

MMX is slated to appear first in a new version of the Pentium processor, code-named the P55C, which is due early next year. Look for MMX support in APIs such as OpenGL and DirectX. (For an in-depth look at MMX technology, see the text box "MMX Accelerates the x86" on page 79.) AMD and Cyrix are both planning to support MMX instructions in their future microprocessors.

There are various ways to distribute 3-D tasks between the CPU and the graphics chip. Graphics boards work with integer

values; therefore, at the very least, the CPU must translate an application's floating-point values into integers.

Most often, the graphics chip works as a rendering engine, while *tessellation* (breaking up a 2-D image into polygons) and *geometry* (adding lighting and perspective) are left to the PC. For the third processing step, *rendering* (adding surface characteristics), low-cost 3-D boards often economize by combining frame, texture, and *z-buffers* (stored depth values) and allocating memory dynamically.

For example, if an application doesn't need a z-buffer (many games do not), the available memory can be used for the texture or frame buffer. Many applications set up the frame buffer in main memory, which is a mixed blessing: This approach saves cost by requiring less memory on the card, but it introduces a major bottleneck, as hidden surface removal has to be done across the PCI bus.

The majority of high-end 3-D accelerators employ separate buffers for frame, texture, and depth information, with each buffer having a capacity of at least 2 MB.

<http://www.byte.com/>

What can you do with 3-D besides play games? To find out, join BYTE editors and 3-D chip designers in an on-line discussion from October 21 through 25.

MMX Accelerates the x86

To improve multimedia and 3-D processing, Intel's new MMX technology can pack multiple pixels into one register and manipulate them with a single instruction. In effect, MMX brings a new level of parallelism to x86 processors.

Instead of adding new physical registers to the x86 architecture (which would slow MMX's adoption), Intel reuses the existing floating-point (FP) stack as logical MMX registers. MMX instructions use only the 64-bit mantissa portion of the 80-bit FP registers, ignoring the 16-bit exponent portion. This yields eight 64-bit logical registers without significantly altering the x86 architecture.

MMX instructions can pack several data types into these 64-bit registers: packed bytes (eight per register), packed words (four per register), packed doublewords (two per register), and a quadword (one 64-bit value per register). These data types are useful because multimedia programs typically work on small units of data. For example, a color pixel in TrueColor mode, the highest commonly used color resolution, uses 24 bits: 1 byte for each RGB color. This mode allows up to 16.7 million colors, more than the human eye can discern. In HiColor mode, only 16 bits are needed for a pixel. For many graphics applications, 16 bits is more than enough.

New x86 processors that support MMX will address the new registers as MM0 through MM7. Instead of treating the registers as a stack—as FP instructions do—MMX instructions can access the registers directly. When switching back and forth between FP and MMX instructions, the existing FSAV instruction saves the state of the registers, and the usual FRSTR instruction restores the values. This keeps MMX technology compatible with existing OSes, which frequently must save and restore the registers when context-switching between multitasking applications.

The downside is that programmers can't mix FP and MMX instructions together because they need the same reg-

isters. But this is not as significant as it sounds, since multimedia programs typically perform their FP operations before displaying the data. (Rendering relies more heavily on integer instructions.)

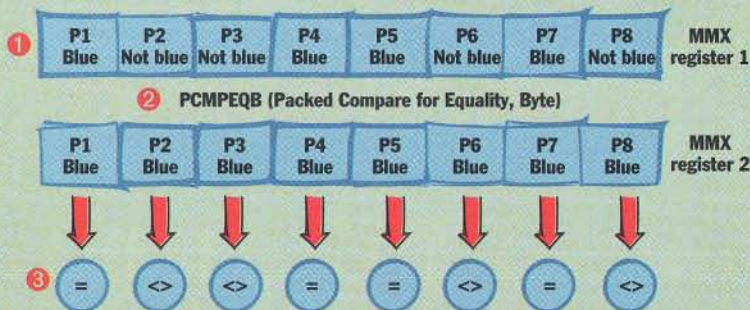
MMX introduces a set of general-purpose integer instructions that use the single instruction/multiple data (SIMD) paradigm. One instruction processes the multiple data in the packed registers. This parallelism increases performance. Incidentally, this concept is not new at Intel. Years ago, the now-obsolete i860 RISC family featured a similar technology, called Pixel Addressing Extension (PAX).

Another feature of the new instruction set, parallel-compare operations, could improve performance by eliminating branches. (Modern processors try to predict branches, but a misprediction means a penalty of several processor cycles.) Combined with packed data features, parallel-compare operations are useful when, for example, you want to combine or overlay two images.

The MMX instructions are similar to those in Sun's Visual Instruction Set (VIS) for the UltraSparc. VIS also packs registers and uses the FP registers. But it has a lot more to offer than MMX: 32 new registers (compared to Intel's eight), accelerated video decompression with discrete cosine transformations, more-powerful addressing modes, pixel masking, and a highly specialized set of operations that greatly accelerates motion estimation when compressing MPEG video streams.

MMX isn't Intel's only new approach to accelerating 3-D. Another new extension for 3-D accelerators is the Advanced Graphics Port (AGP). To evenly distribute main-processor tasks and graphics-chip tasks, the AGP creates a new data path for data transfers between main memory and the graphics card's frame buffer. By skipping the PCI bus altogether, AGP can theoretically allow read and write transfers at speeds up to 400 MBps, according to Intel.

Parallelism Speeds Performance



- 1 MMX instructions can pack 8-, 16-, 32-, or 64-bit values into the 64-bit MMX registers. Here, eight 8-bit graphics pixels are packed into a single register.
- 2 When an MMX instruction executes, all eight pixel values in each MMX register are processed simultaneously. (Here, the instruction compares pixels in registers 1 and 2 for equality.)
- 3 The results of the comparisons. The parallelism gained by having a single MMX instruction process multiple pixel values is faster than if separate instructions had to be issued for each comparison.

However, the cost of buffer memory alone keeps these products out of the mainstream market.

The 3-D Hardware Wave

Although 3-D accelerators divvy up processing tasks in similar ways, 3-D chip architectures can vary considerably. Some

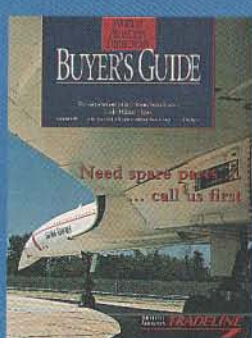
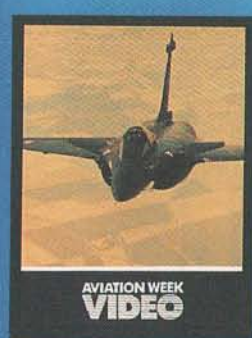
chips are programmable, such as Rendition's RISC-based Vérité and Chromatic's Mpact, which uses a very-long-instruction-word (VLIW) architecture. Two other programmable chips, the TM-1 from Philips and the Mfast from IBM, were not yet shipping at press time.

The performance of programmable

3-D chips depends to a large extent on the low-level software that drives them. Both Rendition and Chromatic currently supply such firmware. OEMs that write their own low-level software can enhance these processors with new features, data formats, or algorithms.

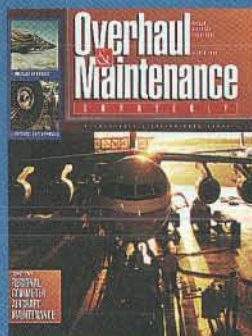
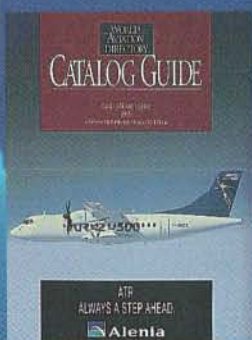
The Mpact's Mediaware microcode

The Aviation Week Group: Print for every professional in global



WORLD TURNS FIRST

and electronic products
aviation and aerospace



AW Group Electronic Products

AWG on CompuServe	Aviation/Aerospace On Line
Aviation Week Video	AW&ST Friday Radio Alert/WTOP-Wash., DC
WAD CD-ROM	LIFTOFF!

Aviation Week Group publications and electronic products comprise the most extensive family of leading information services in the global aviation and aerospace industry. Every publication is the leader in its market.

Whatever your professional affiliation with aerospace, you'll find magazines, newsletters, directories, conferences and electronic media ready-made to serve your specific information needs. Information when you want it, in the format of your choice.

If you are an advertiser, you'll find the Aviation Week Group has the media to match your markets. Civil, Military, Space — Technology, Business, Operations.

Aviation Week Group: 1 million+ readers
140+ countries

CONTACT US TODAY FOR MORE INFORMATION.

SUBSCRIPTIONS
TEL: 1-800-257-9402
FAX: 609-426-7087
(OUTSIDE U.S. CALL 609-426-5526)

ADVERTISING
TEL: 212-512-3084
FAX: 212-512-4225

AVIATION WEEK GROUP

modules allow systems designers to enable or disable specific functions—such as 3-D graphics, videoconferencing, and telephony—to create a single hardware design with a number of different personalities. Unlike the Mpact, the Vértité was designed specifically for 3-D acceleration. It includes a hardwire “pixel pipeline” for critical 3-D operations, such as texture mapping and blending, while the RISC core is responsible for geometry setup and filtering; this relieves the CPU of the majority of the 3-D work load.

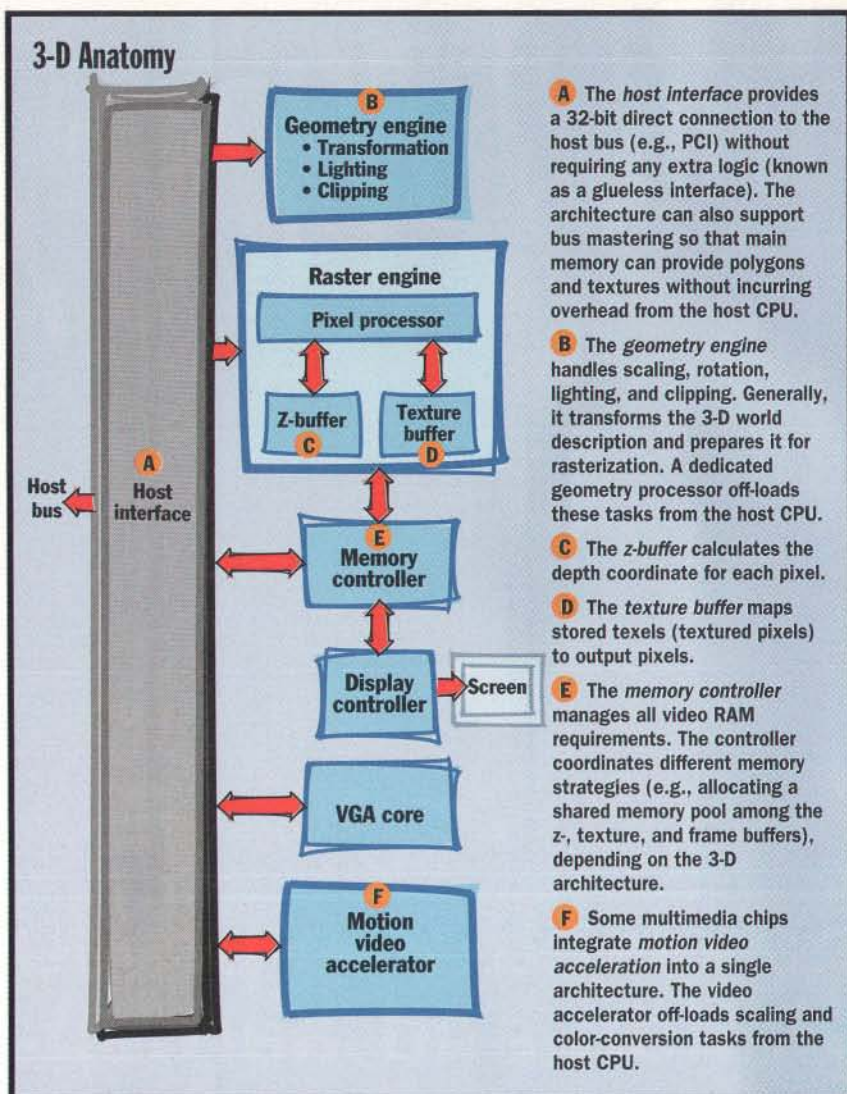
Hard-wired solutions, such as those from Nvidia, 3Dfx Interactive, and 3Dlabs, sacrifice this flexibility but often achieve higher performance. As APIs and other standards evolve, customers must depend on these vendors to update their designs quickly or, in some cases, to develop new software drivers to support the emerging standards.

Nvidia's NV1 requires additional developer support because of its proprietary curve primitive. Instead of building curved surfaces from small polygons, the NV1 generates curves directly to dramatically improve performance when an application requires textured curves. The drawback is that developers must port applications to the Nvidia chip before they can take advantage of these curve primitives.

Many of the graphics companies now offering low-cost 3-D chips and boards have been selling to the 2-D graphics market for years. They offer their customer base a terrific advantage: The new 3-D chips are pin-compatible with the previous generation, so the 3-D chips can slip into a proven card design. For example, the S3 Virge is pin-compatible with the popular S3 Trio64V+. On the downside, not all of these mainstream graphics vendors have the expertise of the established 3-D companies.

3Dfx is one of the few companies in the low-cost 3-D market with a strong 3-D résumé. The firm has made a business of replacing the expensive proprietary engines used in dedicated arcade machines with high-performance Pentiums. Focusing on this specialty, 3Dfx has designed a dedicated 3-D chip that delivers impressive 3-D acceleration but lacks integrated functionality, such as standard GUI acceleration and motion-video playback.

A dedicated 3-D solution does not replace a PC's graphics card; instead, it complements it with a “pixel pump” that works in parallel with the graphics accelerator



that's on a separate PCI board. After the 3-D chip calculates the pixels, they pass across the PCI bus to the graphics card.

Like the 3Dfx Voodoo Graphics accelerator chip set, VideoLogic's PowerVR is a dedicated 3-D chip that requires an existing graphics accelerator. To compete with integrated solutions, 3Dfx has formed a partnership with Alliance semiconductor to combine the Voodoo with Alliance's ProMotion graphics controllers.

Bring on the Boards

Now that 3-D chips are appearing on commercial boards, we are seeing some 3-D warts along with the glitter. One particularly unpleasant surprise is that 3-D acceleration in many low-cost boards works only in one mode—namely, at a resolution of 640 by 480 pixels with 64,000 colors.

This is fine for play, since today's 3-D games don't require any more screen real

estate than that. But this situation will eventually change. As more business applications use 3-D, 640 by 480 is becoming all but useless, and switching back and forth between resolutions quickly gets tedious. It's better to instead consider cards that accept additional memory to support 3-D acceleration at 800 by 600.

Many vendors bundle games with their 3-D boards. Some of these games use special features of that vendor's hardware; we've even heard of programs that use a high-level API, such as Microsoft's DirectX family of interfaces, and still use hardware references to stop users from switching horses. In addition, games developers are fond of squeezing every last bit of performance out of the hardware.

Since the jury is still out on how much of a performance penalty the multiple software layers in Microsoft's 3-D APIs will inflict, some people might be tempted to

INTERNET/INTRANET ACCESS ROUTER

for instant Internet/Intranet connectivity

COST COMPETITIVE

for small and medium-sized networks

NO HASSLE INSTALLATION

compact, easy to use

NETWORLD+INTEROP 96
PARIS-HALL 7, #G27 LONDON-BOOTH #16

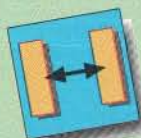
<http://www.rad.com>

ATTENTION: Internet Service Providers and Network Managers.

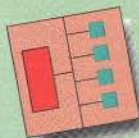
WEB RANger™

WEB RANger™ is a compact IP access router that connects small or medium-sized offices to the Internet or private IP networks over ISDN, dial-up links, leased lines and digital data services. Designed for fast, no fuss installation and setup, the WEB RANger's attractive price makes it the ideal Internet access solution for ISPs and corporate network managers alike.

For more information contact RAD Data Communications at <http://www.rad.com>



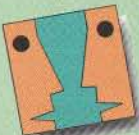
**Compatible with
3rd party PPP
devices**



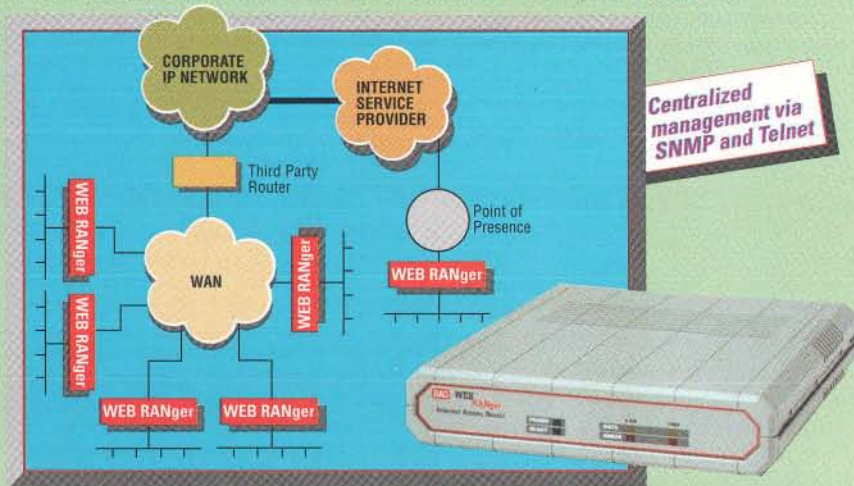
**Easy installation
and setup**



**Firewall security
feature protects
your network's
data**



**Connection On
Demand (COD)
significantly
reduces WAN
costs**



International Headquarters: 12 Hanechosht Street, Tel Aviv 69710, Israel, Tel: 972-3-6458181, Fax: 972-3-6498250

U.S. Headquarters: 900 Corporate Drive, Mahwah, NJ 07430, Tel: (201) 529-1100, Fax: (201) 529-5777

RAD Far East Ltd.: Suite A, 26/F, One Capital Place, 18 Luard Rd., Wanchai, Hong Kong, Tel: 852-25270101, Fax: 852-25284761

RAD America Latina S.A.: Viamonte 1345-3 Piso G, 1053 Buenos Aires, Argentina, Tel: 54-1-3714000, Fax: 54-1-3710734

RAD Data Communications GmbH: Lyoner Strasse 14, 60528 Frankfurt am Main, Germany, Tel: 069-66554414, Fax: 069-66554100

RAD Data Communications Ltd. (U.K.): Oakridge House, Wellington Rd., Cressex Business Park, High Wycombe, Bucks HP12 3PR, U.K., Tel: 01494-443315, Fax: 01494-443317

RAD France: 315 Square des Champs Elysees, 91026 Evry Cedex, France, Tel: (331) 6091-3432, Fax: (331) 6091-3401

Copyright 1996, RAD Data Communications. All registered and unregistered trademarks are the sole property of their respective companies.

RAD

data communications

Circle 714 on Inquiry Card.

3-D Chip Features

	ATI Rage	3Dfx Voodoo	3DLabs Permedia	Chromatic Mpact	Matrox MGA-1064SG	Nvidia NV3	Oak OTI64311	Rendition Vérité	S3 Virge	Trident T3D9695	VideoLogic PowerVR
Memory/buffering											
Memory required (MB)	1	2	2	2	2	2	1	2	2	2	2
Memory type	SGRAM	EDO	SGRAM	RDRAM	SGRAM	SGRAM	EDO	EDO	EDO	SGRAM	EDO
Texture buffer required		✓			✓		✓				✓
Z-buffer required	✓	✓				✓					
3-D features											
Antialiasing	✓	✓		✓			✓	✓			
Trilinear filtering	✓	✓		✓			✓	✓	✓	✓	
Subpixel positioning	✓	✓	✓	✓		✓	✓	✓	✓		✓
Atmospheric effects	✓	✓	✓	✓		✓	✓	✓	✓		✓
Integrated features											
2-D acceleration	✓		✓	✓	✓	✓	✓	✓	✓	✓	
Video acceleration	✓		✓	✓	✓	✓	✓	✓	✓	✓	
RAMDAC	✓				✓		✓		✓	✓	
Video out	Optional				Optional		✓			✓	
All chips support the following features:											
Alpha blending	Filtering (point-sampled, bilinear)					PCI interface (glueless)			Shading (flat, Gouraud)		
Dithering	Graphics primitives (points, lines, triangles)					Perspective correction			Textures		
Double-buffering	MIP mapping					Rastering					
✓ = yes.											

bypass them. In the long run, only hardware and software that supports the relevant APIs will survive. Until then, shoppers should select a board that has all the drivers needed for it to perform with the software they expect to use.

If you have a high-performance graphics board and just want 3-D acceleration, then something like VideoLogic's PowerVR, working in parallel with the main graphics board on a separate PCI card, could be an ideal solution.

Nonstandard 3-D

Currently there are about 50 APIs for 3-D. This situation is not conducive to matching the hardware flood with the ground swell of cool mass-market applications.

APIs—the libraries of boilerplate routines that define standard sets of graphics functions—give programmers “hooks” into an otherwise-closed environment, such as an OS, a database, or hardware drivers. In the 3-D arena, APIs also function as an isolating layer to protect applications programmers from the idiosyncrasies of proprietary hardware. *continued*

3-D Glossary

- **Alpha blending:** Support for true object transparency in hardware. An alpha value defines the transparency of each pixel. The accelerator takes this transparency value into account when drawing objects, perhaps by blurring an object when it passes behind a transparent object or changing the color of a transparent foreground object to match that of a background object.
- **Antialiasing:** An antialiasing algorithm will slightly blur diagonal lines and other effects to better simulate a smooth line.
- **Atmospheric effects** (fogging and depth cueing): Fogging creates a haze over a scene. Depth cueing changes the color and hue of an object in accordance with the object's distance from the viewer.
- **Bilinear versus point-sampled filtering:** To interpolate pixels, some low-end 3-D algorithms take the nearest adjacent pixel (i.e., the nearest neighbor sampling) and replicate its color. Small on-screen movements can cause full pixels to change color, causing aliasing and unwanted screen artifacts. Bilinear filtering averages the 4 nearest texels (textured pixels) to interpolate a pixel, producing a higher-quality image.

• **MIP mapping:** When a texture is applied to an object, it often has to be resized or stretched to fit. This process degrades the texture image. MIP mapping creates three or more copies (called *MIP levels*) of the texture, each of a different size, so that the best-fitting copy can be used.

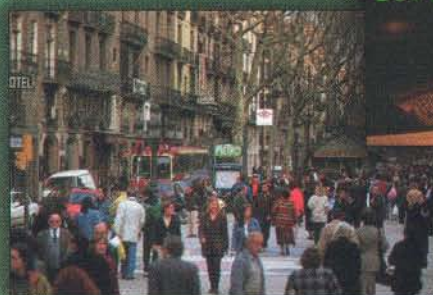
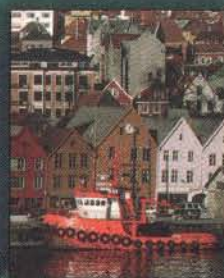
• **Perspective-correct texture mapping:** Texture maps that continually change to match the perspective of the viewer.

• **Subpixel positioning:** If a line does not run directly through a pixel, it must be moved to the nearest one, which introduces positional error. Pixels can be broken down into smaller subpixels in memory so that the line can be drawn to the nearest subpixel.

• **2-D and GUI acceleration:** If your 3-D accelerator also acts as your primary graphics card, make sure that it supports 2-D and GUI acceleration. Otherwise, the performance of your standard Windows applications will degrade noticeably.

• **Video acceleration:** If your applications include motion video, look for an accelerator that supports hardware video acceleration. Video acceleration performs color-space conversion and scaling in hardware, removing that chore from the host CPU and improving the quality of video clips.

BYTE's Pan-European Postcard Deck Targets Influential European Technology Experts



T

he BYTE EURO-DECK offers a unique direct mail approach to increasing sales in the \$114 billion European computer market. Reach 50,000 BYTE subscribers for under 4¢ per reader!

Circulation of the BYTE EURO-DECK is targeted to computer experts in over 20 countries in Western Europe. Take full advantage of the benefits BYTE provides with this affordable,

direct channel to Europe. For information on the next BYTE EURO-DECK, call Mark Stone at 603/924-2533, fax him at 603/924-2683 or use E-mail: 104124.1255@compuserve.com.

BYTE
EURO  **DECK**

The three leading API contenders for mainstream 3-D are OpenGL, QuickDraw 3D (QD3D), and Direct3D. The latter has the advantage of Microsoft's marketing might, while the cross-platform capabilities of the other two make them important for developers not tied to Windows.

OpenGL originated as the Graphics Library for the Silicon Graphics, Inc. (SGI), Iris graphics systems. It's the oldest of the three APIs and now has the broadest base among Mac, PC, and Unix developers. It focuses on drawing 2-D and 3-D objects quickly and is generally more low-level than the other two APIs.

For instance, it does not include complex predefined objects, automatic shadows, ray-tracing, or radiosity functions. It's currently the undisputed standard for scientific and engineering applications, and it is associated more with high-end CAD, simulation, and visualization than with photo-realistic games. In a move to broaden the API's appeal from the professional market to general-purpose desktops, SGI recently teamed up with Sun Microsystems to develop CosmoGL, which is a variant of OpenGL that speeds texture mapping for 3-D Web applications and games in Windows 95 and NT.

OpenGL offers an impressive, if basic, array of approximately 120 functions for polygon shading, rotation, scaling, atmospheric effects, depth cueing, and other functions. But OpenGL lacks the object-oriented design of QD3D and Direct3D. You use the API as a *state machine*, which means that parameters "stick" until you change them. This saves work for developers, but nasty bugs can arise if the programmer forgets to save states and restore them when exiting from a routine.

OpenGL uses a client/server model, so it enables you to process compute-intensive tasks in a distributed environment. Because it does not include windowing functions, it works independently of the UI. It attaches to OSes and GUIs through extension libraries.

OpenGL is complemented by Open Inventor, a higher-level, object-oriented library. You can use Open Inventor as a layer above OpenGL to add features such as geometry, motion and lighting, and material editors. Like OpenGL, Open Inventor has been licensed to other companies. For instance, the Virtual Reality Modeling Language (VRML) format for virtual worlds on the Internet is based on Open Inventor.

continued

Why Memory Matters

Memory and memory speed play pivotal roles in how realistic 3-D looks on our screens. It's important for the CPU to write pixel data to the image buffer quickly, but it's much more critical for the graphics-board circuitry to get data out to the screen.

The old VGA standard of 640- by 480-pixel resolution required a total of 307,200 pixels; at 16 colors, these pixels fit into 153,600 bytes of memory. A reasonably fast graphics driver would fill that memory in about a tenth of a second using a memory bandwidth of 1.5 MBps. Because VGA uses a vertical-refresh rate of 60 Hz, 150 KB of image memory had to be output to the screen 60 times per second, resulting in a memory bandwidth of just over 9 MBps on the video side.

The situation heats up considerably for the modern resolutions of SVGA and better. To accommodate a moderate 1024 by 768 pixels at 65,536 colors (16 bits per pixel), the image buffer has to hold about 1.6 MB of data. Thus, the CPU needs a bandwidth of 16 MBps to write data to the graphics board. This is no big deal on the PCI bus, which can handle up to 60 MBps. But to get the image out to the screen at an ergonomically correct 75 times per second, the board must read from its image memory at 120 MBps. For 1280 by 1024 resolution, you need a sustained throughput rate of 196 MBps.

How memory delivers this performance depends on the bus width used in the graphics card's design. Basically, more memory bandwidth can be achieved either with faster memory chips or by using several chips in parallel. ISA-bus graphics boards and their chips were generally designed for a data-bus width of 16 bits; to support high screen resolutions, you need fast video RAM (VRAM).

VRAM chips are dual-ported: To the graphics chip, they look like standard DRAMs, but a second port is used for output. Thus, data can be read and written simultaneously; screen updates do not result in lost cycles. A recent development, Window RAM (WRAM), is basically faster VRAM enhanced with special graphics features, such as accelerated, aligned fills and moves.

Given that memory comes in a fixed bus width, watch out for boards that support a bus width of 64 or 128 bits but are sold in economy versions where only half the memory is fitted. For example, a 128-bit board might be designed for 4 MB of RAM, needing eight memory chips, each with a bus width of 16 bits. If only 2 MB is installed, which degrades the bus width to 64 bits, you effectively end up with a lower-performance, 64-bit board. Of course, you can install the missing memory later.

Modern boards, which transfer data at 64 or even 128 bits in parallel, can actually use slower, less expensive memory. For example, board designers can combine standard extended data out (EDO) RAM with a 64-bit bus to achieve a throughput of 240 MBps. Burst EDO RAM delivers about 400 MBps.

Memory manufacturers have come up with a variety of special designs for even-faster throughput, needed for larger color palettes. Some designers put several chips in a single housing and combine them with logic circuitry that allows overlapping access. Each unit works at the speed of standard DRAM, but parallelism increases throughput. All the variations of DRAM described below are single-ported.

Synchronous DRAM (SDRAM) and synchronous graphics RAM (SGRAM) are available from several sources and have already found a flock of followers in the graphics-controller industry. While DRAM needs several special strobe signals, synchronous RAM can handle the memory clock directly. At a bus width of 64 bits, SDRAM can support bandwidths up to 640 MBps. SGRAM adds features that accelerate graphics performance, such as block write (which is useful for video).

Multibank DRAM (MDRAM) combines eight 32-KB banks into blocks of 256 KB. It supports 500-MBps throughput. Tseng Labs' ET6000 graphics chip sports a special 128-bit MDRAM interface, yielding up to 1000 MBps.

Rambus DRAM (RDRAM), a general-purpose memory design, has a bus width of only 8 bits and therefore needs a very high memory clock of 250 MHz. Transfers reach 500 MBps.

Introducing Great Visual Color!

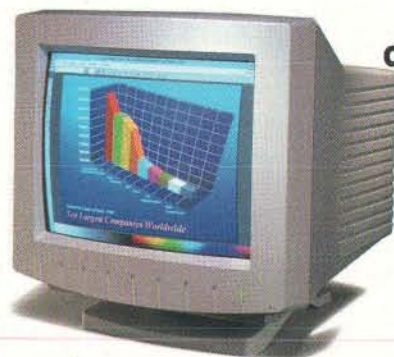
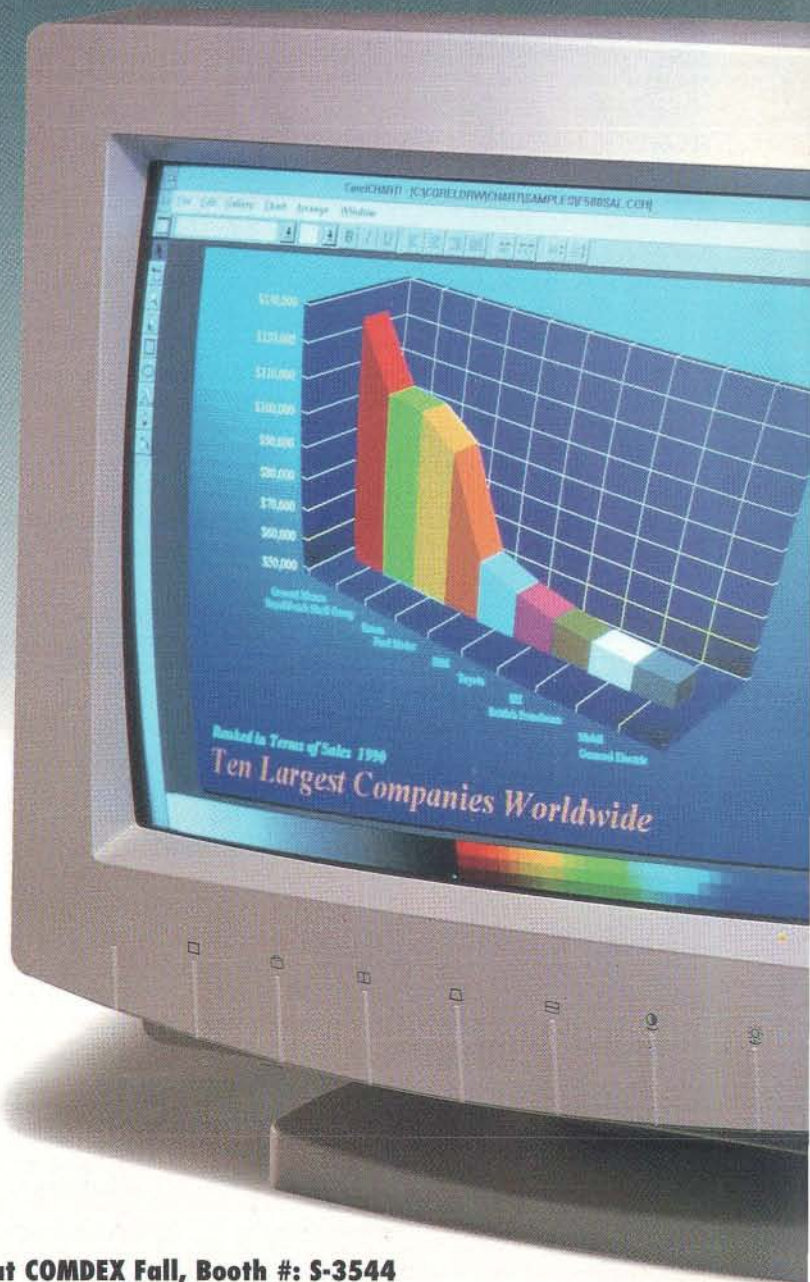
**Announcing GVC's
CREAVISON professional
color monitor series!**

In today's graphical computing environment, a high quality affordable monitor is essential in keeping up with the demands of 3D graphics, animation, and Internet browsing.

GVC's new line of professional monitors offer you state of the art features such as On Screen Display (OSD) for easy adjustment. Our high-resolution, high-contrast screens bring you exceptionally vibrant colors and crystal clear images.

More importantly, from our extensive experience as a world-wide top tier OEM supplier, we are able to provide you with exceptional values!

*To find out more, please contact us at
8F, 80, Sec. 2, An-Ho Road,
Taipei, Taiwan, R.O.C.
Tel:886-2-701-2226
Fax:886-2-704-0338
E-Mail:monitor@gvc.com.tw*



Come visit us at COMDEX Fall, Booth #: S-3544

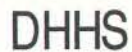
Model	CRT type	Horizontal Frequency	Vertical Frequency	Resolution (Max.)	Front panel control	Option
M1448	14"/0.28	30-50KHz	50-90Hz	1024x768	analog	
M1450	14"/0.28	30-50KHz	50-90Hz	1024x768	digital	speaker
M1558	15"/0.28	30-56KHz	50-90Hz	1024x768	analog	
M1565	15"/0.28	30-69KHz	50-90Hz	1280x1024	digital	speaker
M1568	15"/0.28	30-69KHz	50-90Hz	1280x1024	digital OSD	
M1764	17"/0.39	30-69KHz	50-90Hz	1024x768	digital	speaker
M1765	17"/0.28	30-69KHz	50-90Hz	1280x1024	digital OSD	speaker
M1785	17"/0.26 Diamondtron	24-85KHz	40-100Hz	1600x1200	digital OSD	speaker



GVC CORPORATION
DISPLAY BUSINESS UNIT



FCC BZT
CLASS B CLASS B



GVC IS REGISTERED TRADEMARK OF GVC CORPORATION. OTHER BRANDS AND PRODUCT NAMES ARE TRADEMARKS OF THEIR RESPECTIVE HOLDERS
Circle 747 on Inquiry Card (RESELLERS: 748).

QD3D, which premiered in early 1995 as a graphics extension to the Mac OS, now includes Windows support. Because QD3D is fully object-oriented, new object instances can inherit complex features (including lighting, geometry, and textures) to simplify the construction of 3-D images.

QD3D stores scene and object information with its own portable data format, which is called 3D Metafile (3DMF); it offers a choice between a compact binary and a human-readable version and supports the cutting and pasting of 3-D objects via the Clipboard. You can store QD3D objects in image databases and use simple drag-and-drop techniques to move objects from the database into a 3-D scene.

QD3D includes standard 3-D primitives, but, unlike OpenGL, it knows about complex geometry, such as nonuniform rational B-splines (NURBS). Its extensible architecture enables you to add new software-rendering engines and access hardware accelerators. Another nice detail is the interactive renderer, which lets you see and manipulate objects directly during design. Many applications let you work with the interactive renderer directly.

For developers who'd rather work with a low-level, but still hardware-independent, 3-D API, Apple offers the Rendering Acceleration Virtual Engine. RAVE can act as a plug-in module within QD3D to provide a hardware abstraction layer (HAL). RAVE includes basic graphics primitives; however, it doesn't offer high-level functions, such as the importing of objects. Like QD3D, RAVE supports Macs and Windows-based machines.

Microsoft's DirectX, the latest mem-

ber of the DirectX family of interfaces, is part of a three-layered structure (Direct3D itself is actually the middle layer). The lowest layer is the HAL, which contains the hardware-specific device drivers. Above that is the low-level API layer, which grants access to hardware features while maintaining hardware independence. The layer above it contains Microsoft's own high-level API, previously known as RealityLab (which was snagged in Microsoft's acquisition of RenderMorphics). This highest layer can also accept other APIs as plug-ins, including OpenGL. Above these three layers is the applications layer; below them lies the hardware.

Applications built on the DirectX family can query the system to determine what functions are implemented in hardware. For functions that are not supported, the application might substitute a simpler algorithm. However, Direct3D can also emulate any function in software, thanks to the Hardware Emulation Layer (HEL).

Like QD3D, Direct3D offers a clean, object-oriented, extensible architecture. What functions are actually available depends to some extent on the high-level layer. With the default RealityLabs API on top, Direct3D is not as versatile as QD3D because it lacks basic 3-D objects, such as cylinders, spheres, and cones. Still, it offers functions that go beyond OpenGL's, including animation features, which are particularly useful for games developers. Direct3D's main drawback is that it's limited to Win 95.

The 3-D Future

Eventually we may take 3-D for granted, much like gigabyte-capacity hard drives

API

Strengths and Weaknesses

OpenGL

- + Supports Mac, PC, and Unix developers.
- + Quickly draws 2-D and 3-D objects.
- + Offers an impressive array of rendering functions.
- Not object-oriented.

QuickDraw 3D

- + Supports the Mac OS and Windows.
- + Fully object-oriented.
- + Lets you drag and drop objects into a 3-D scene.
- + An interactive renderer manipulates objects during design.

Direct3D

- + A member of the DirectX family of interfaces.
- + Offers a clean, object-oriented, extensible architecture.
- Not as versatile as QuickDraw 3D, because it lacks some basic 3-D objects.
- For Windows only.

and 16 MB of memory. However, because 3-D adds complexity to applications, it will take a fair amount of time for software developers to master the technology. Therefore, we probably won't see 3-D hit critical mass until 1997 or later. Until then, only games publishers, who stand to profit first and most by 3-D, will be willing to devote significant resources to the development of 3-D.

Just like the GUI-enhanced software that seemed so cumbersome to users for many years, 3-D will suffer many development blunders along the way before killer 3-D apps emerge and 3-D UI elements become as natural and efficient to use as today's dialog boxes and scroll bars. And as 3-D becomes pervasive, business users will need, rather than just want, 3-D enhancements. **B**

Udo Flohr is a BYTE contributing editor based in Hannover, Germany. You can reach him at flohr@dfn.de.

WHERE TO FIND

ATI Technologies, Inc.
Thornhill, Ontario, Canada
(905) 882-2600
fax: (905) 882-2620
<http://www.atitech.ca>

Chromatic Research, Inc.
Sunnyvale, CA
(415) 254-0729
<http://www.chromatic.com>

Matrox Graphics, Inc.
Dorval, Quebec, Canada
(800) 361-1408
(514) 969-6320
fax: (514) 969-6363
<http://www.matrox.com>

Nvidia
Sunnyvale, CA
(408) 720-6100
fax: (408) 720-6111

Oak Technologies
Sunnyvale, CA
(415) 962-9550

Rendition, Inc.
Mountain View, CA
(415) 335-5900
<http://www.rendition.com>

S3, Inc.
Santa Clara, CA
(408) 980-5400
fax: (408) 980-5444
<http://www.S3.com>

3Dfx Interactive
Mountain View, CA
(415) 934-2400
fax: (415) 934-2424
info@3dfx.com

3Dlabs, Inc.
San Jose, CA
(408) 436-3455
fax: (408) 436-3458
<http://www.3Dlabs.com>

Trident Microsystems
Mountain View, CA
(415) 691-9211

VideoLogic, Inc.
San Bruno, CA
(800) 578-5644
fax: (415) 875-4167
<http://www.videologic.com>

Does Digital Video Get Any Better?



Yes, it does: miroVIDEO DC30.

Professional studio quality video for your PC,

because

miroVIDEO DC30 PCI bus mastering provides the fastest data rates (up to 6 MB/sec), the highest resolution (4:2:2 YUV TrueColor) with the best image quality (3.5:1 compression).

CD quality audio with perfect lip synchronization,

because

miroVIDEO DC30 integrates audio with video on a single board so you don't miss a beat.

Real-time video-overlay,

because

miroVIDEO DC30 displays full-motion video directly on the PC monitor at all times. True WYSIWYG video during capture, edit and print-to-tape.

Optimal hard disk usage,

because

miroVIDEO DC30 has fully adjustable video resolution and compression settings to provide the best video quality in the space available.

High-speed video editing,

because

miroVIDEO DC30 has specialized hardware and world-class drivers to accelerate video editing software – up to 10 times faster with Adobe Premiere software during “make movie” and “preview edit” mode.

Professional digital video and audio editing system

- ▶ PCI bus mastering technology, for the fastest data rates up to 6 MByte/sec.
- ▶ On-board CD audio
- ▶ Ready for Windows 95
- ▶ Input and output for S-VHS, Hi8, VHS, Video8
- ▶ All standards: NTSC, PAL, Secam at CCIR 601 pixel format and square pixels



COMDEX
Fall '96

miroVIDEO DC30

miro

Circle 183 on Inquiry Card (RESELLERS: 184).

miro US (415) 855-0940 - miro D (531) 2113-200 - Internet: <http://www.miro.com>

How to Tame Big Networks

Whether you're designing, simulating, or maintaining extra-large networks, smart software tools can help.

Q uantity has a quality all its own. While running a 10-node network might be challenging, and handling a 100-node network might be absorbing, designing and maintaining a 1000-plus-node network are harrowing tasks. The larger the network, the more likely it is to contain a variety of hardware platforms, OSes, connection schemes, and protocols that span countries and continents. In short, bringing order to this potential chaos is more than a single, mortal administrator can handle.

The mega-network administrator's primary concern, of course, is how to foist off this crushing burden. The good news here is that tools exist just for this purpose.

For example, designing a large network or adding onto your existing behemoth can be taxing, since you have to consider so many parameters, including throughput, location, compatibility, size, and budget. New graphical tools let you assemble big networks from databases of components as if you're piecing together Tinkertoys—and smart Tinkertoys at that, since some of these tools can tell you if you're making blunders such as using an underpowered server for an engineering workgroup.

If instead of designing a network from scratch you must integrate two existing networks, modeling tools can give you the big communications picture. Some products make you get your hands dirty and fill in all the details about the components yourself, while others, using "automatic discovery," quiz the myriad components and construct a model for you.

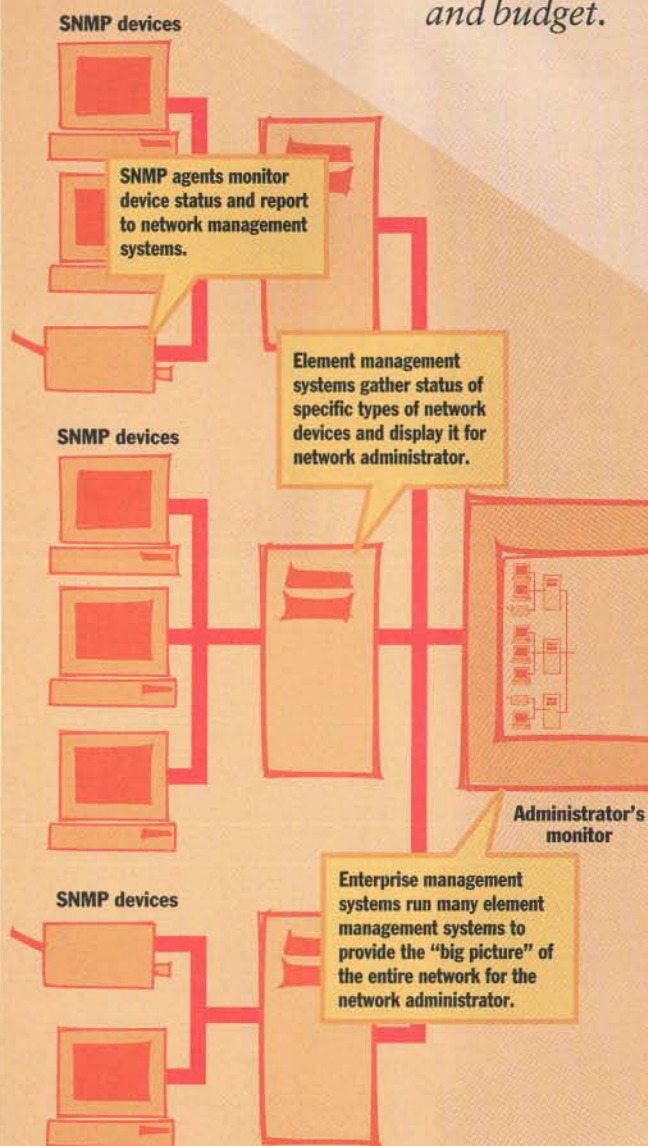
With so many interconnected components to watch over, maintenance might be your biggest headache. Most network-administration centers look like NASA Mission Control, with all their flickering monitors, each tuned to specific hardware components. Enterprise management systems can reduce the number of monitors you have to stare at each day, and they also consolidate information that logically belongs together. Event-correlation capabilities can even figure out automatically that, yes, it *was* that iffy router on the thirteenth floor that just triggered the 42 irate calls the help desk just fielded.

The harried system administrator is no longer alone in the battle to keep a company's information electrons flowing efficiently. And that can bring some quality to the business of handling all that quantity.

—Edmund X. Dejesus

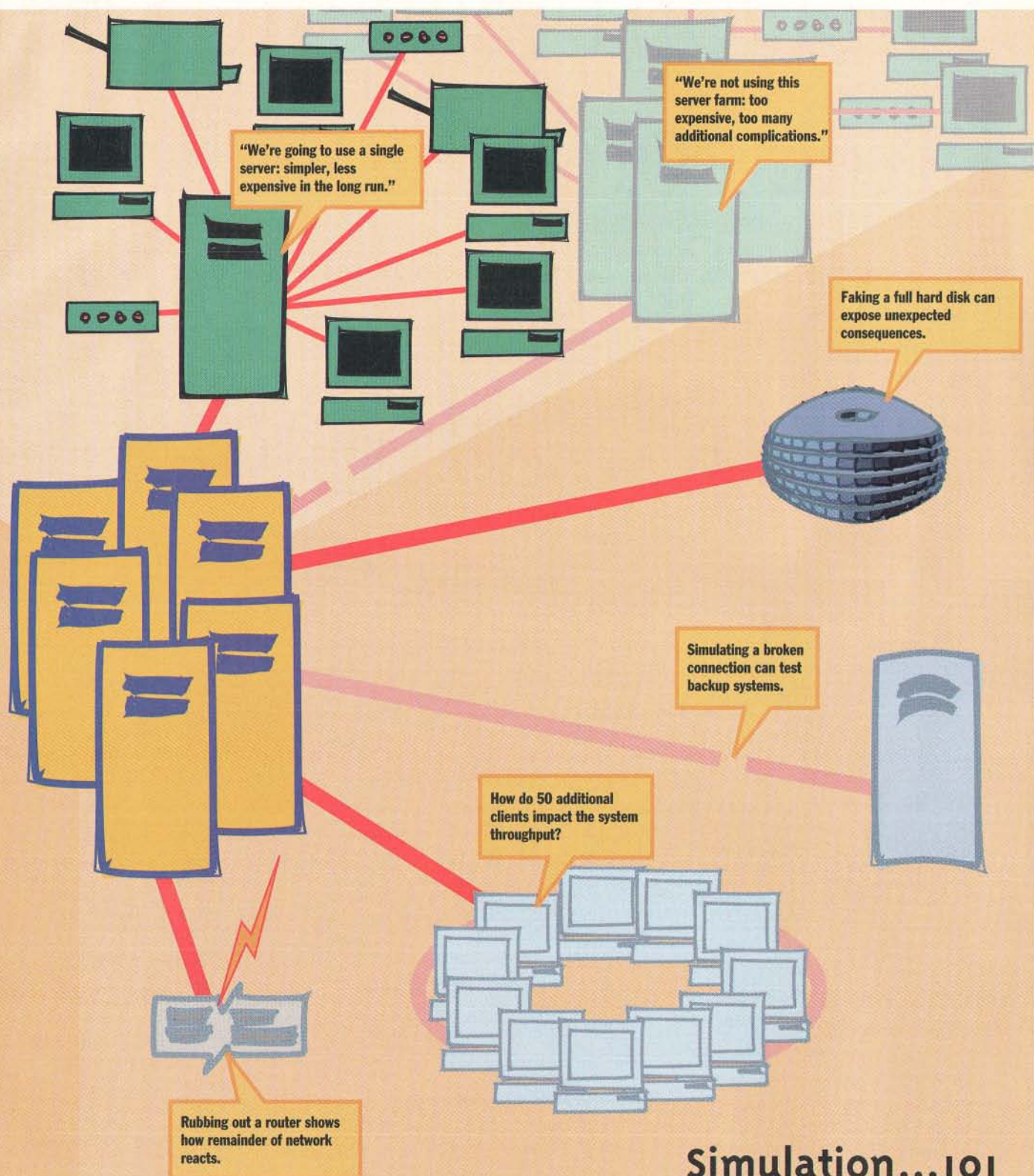
Design...93

Designing or changing large networks with graphical tools can produce viable plans that meet your goals of performance, compatibility, and budget.



Maintenance...107

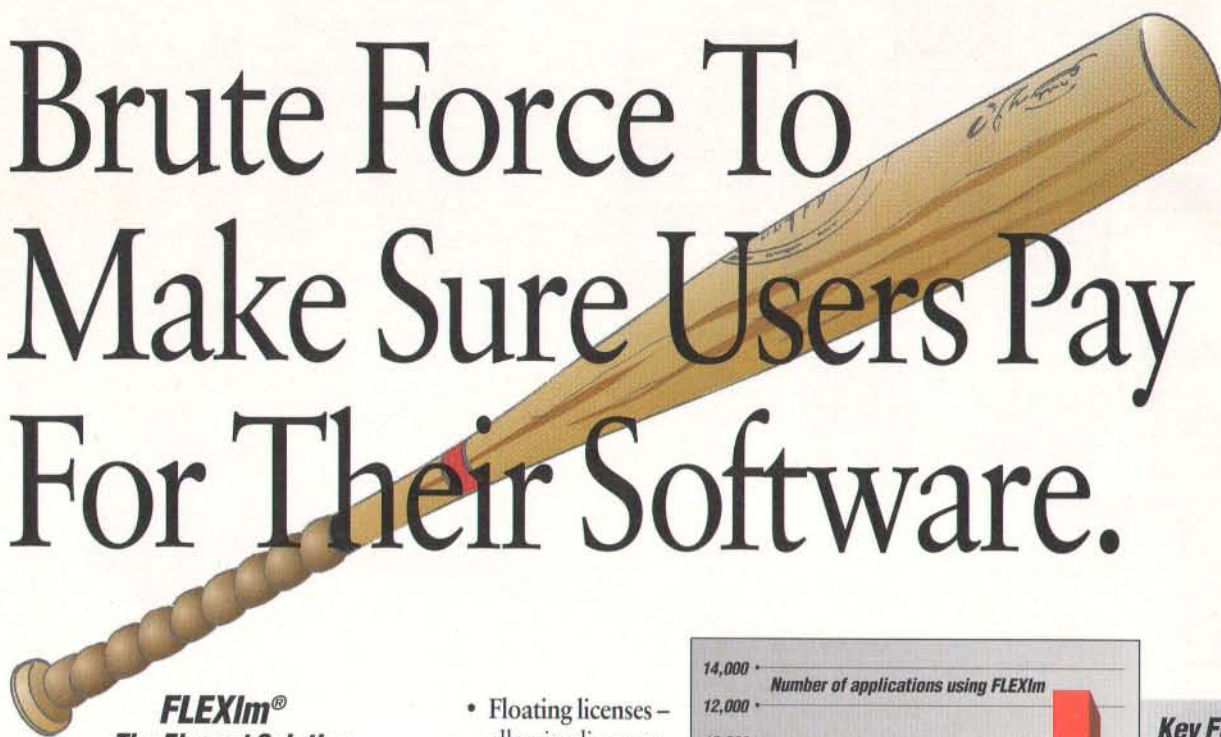
Network management is simpler with devices that report their own status and with systems that consolidate and simplify the presentation of network status.



Simulation...101

Simulation brings your big picture to life, allowing what-if scenarios that you pray will never happen.

You Don't Have To Use Brute Force To Make Sure Users Pay For Their Software.



FLEXlm® **The Elegant Solution**

You don't have to use the brute force of a baseball bat – or dongles for that matter – to make sure only licensed, paying users have access to your software. There's a much more elegant and cost-effective solution: FLEXlm from GLOBEtrotter.

The De Facto Standard

FLEXlm is bundled in over \$15 billion of installed UNIX™ and Windows™ software products, making it the *de facto* standard in license management. And in 1995 alone, FLEXlm was used to ship over \$3 billion in software licenses over the Internet. That makes it the *de facto* standard in electronic commerce for software, too.

Even Works With Dongles

If you still want to use dongles, FLEXlm significantly reduces the number you need at a customer site by allowing low-cost dongles to be used as "network dongles," and by sharing dongles across different products.

Your Customers Will Like It

In an independent survey, users preferred FLEXlm eighteen-to-one over other license managers. And all of us know customers really don't care for dongles. With FLEXlm, your customers benefit from:

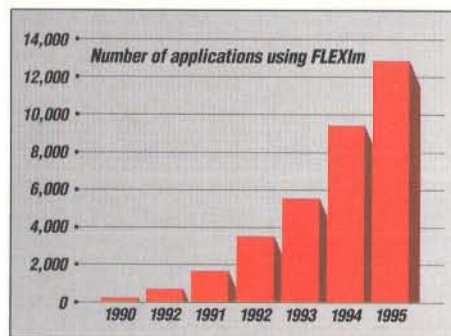
- Floating licenses – allowing licenses to be shared over a network, while fairly compensating the vendor with a higher price per license.
- Fully functional evaluation software while the vendor knows the software will stop after a specific date.
- Built-in license compliance – customers don't need to buy expensive license metering utilities to verify they comply with vendor license terms.
- Installing software where it is most appropriate from a hardware or administration perspective, while protecting your software.

Windows, UNIX and Java

If your company develops products on multiple platforms, you should know FLEXlm runs on Windows, UNIX and Java.

For More Information

Call us at 408-370-2800, email us at info@globetrotter.com or visit our website at <http://www.globetrotter.com>. We'll be happy to arrange a demo and show you how to make sure all your users are licensed.



Key Features: With FLEXlm you can:

- Limit software use to licensed users
- License software in new ways

to gain new markets and customers

- Leverage the Internet and CD-ROMs to increase sales while reducing selling and manufacturing expenses
- Reduce the cost of product evaluation programs
- Significantly reduce the use of expensive dongles

**Ask about our white paper on
Electronic Commerce
For Software**

GLOBEtrotter

Electronic Commerce
For Software™

<http://www.globetrotter.com>
Email: info@globetrotter.com
Telephone: 408-370-2800
Fax: 408-370-2884

Circle 192 on Inquiry Card.

FLEXlm is a registered trademark and "Electronic Commerce For Software" is a trademark of GLOBEtrotter Software. All other trademarks are the property of their respective owners.

Forget pencil and paper: Today's intelligent tools do the design work for you. By Nathan J. Muller

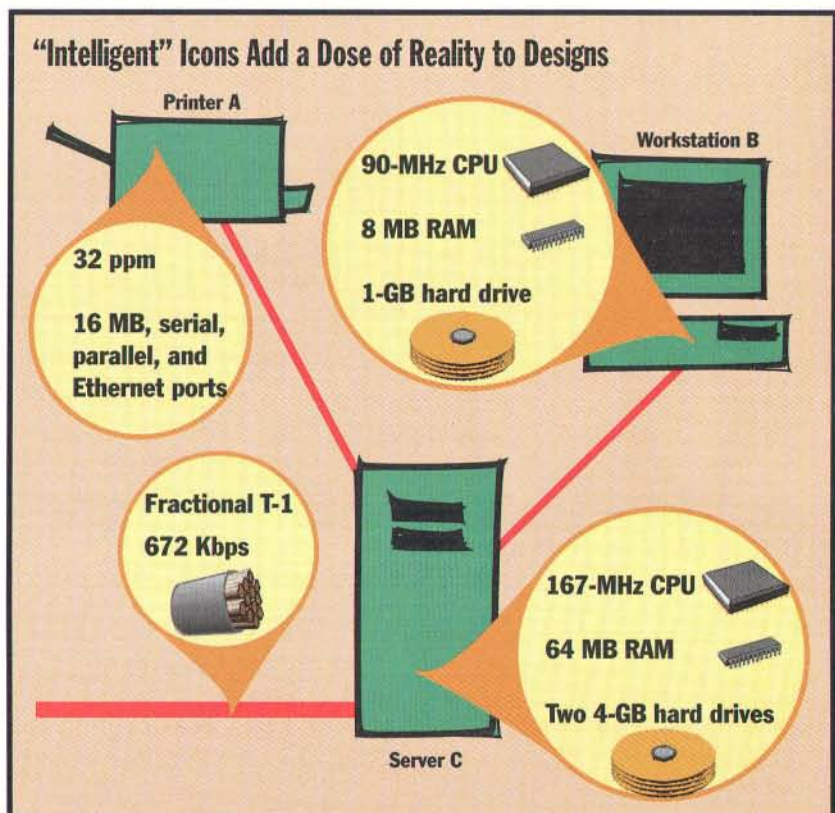
Design and Conquer

Experience tells us that a properly designed network can help an organization improve customer service, pursue new business opportunities, and respond faster to market forces. But large networks, often supporting tens of thousands of users worldwide, present special design challenges. Typically, such behemoths consist of a dizzying array of transmission facilities, LAN technologies, protocols, and standards—all cobbled together to meet the differing needs of workgroups, departments, branch offices, divisions, subsidiaries, and, increasingly, strategic partners, suppliers, and customers.

As if this complexity were not enough, big networks are usually in a state of flux. Corporate requirements, technologies, and standards change over time. Carriers introduce new services. Vendors offer new and better products. With continual moves, adds, and changes, a company's traffic patterns begin to shift. Before you know it, applications are gasping for bandwidth, response time slows to a crawl, and frustrated users start looking steely-eyed at the network administrator.

Hidden costs associated with poor network designs include overspending on equipment and WAN links to ensure sufficient capacity, trouble reports, poor response to network problems, unpredictable delays in meeting work schedules, and high labor costs for frequent rush jobs.

Fortunately, automated tools are available to help you head off these sorts of problems at the pass. With built-in intelligence, these tools take an active part in the design process (see "Design's Four Stages" on page 94). With the type of software we'll discuss in this article, you can build a computerized model of a network; validate its design and gauge its performance; quantify equipment requirements; and explore reliability and security issues before you purchase a single network component. Some of these



With some network design tools, hardware icons contain configuration information about the components they represent.

tools may even identify faulty equipment configurations, design flaws, and standards violations.

Network Designer Tools

Because of the size of the network designs they handle, these tools typically run on Windows NT, Unix, and SunOS. There are two notable exceptions: Supporting Windows 95 (as well as Windows 3.1) are Network Design and Analysis's AutoNet, a program for designing T-carrier networks, and American Hytech's NetGuru, for designing LANs and networks of unlimited size.

At the low end, prices for design tools begin at \$495 (for NetGuru). At the high end, prices range from \$5000 for Image-

Net's CANE (Computer Aided Network Engineering) to \$15,000 or more for MIL 3's OpNet and Make Systems' Net-Maker XA, depending on the type and number of optional plug-in modules. For companies that do not have the time or expertise to learn and use these tools themselves, some vendors, such as Make Systems, offer outsourcing services based on their software; cost of such services starts at \$1750 a day.

When working with these tools, you begin the build-a-network process by opening a blank drawing window, into which you can drag various vendor-specific devices—workstations, servers, hubs, routers—from a product library and drop them into place (see the screen

on page 96). You can further define the devices by component type, software, and protocols, as appropriate. Lines link the devices to form a network, and each link gets assigned physical and logical attributes. Rapid prototyping provides the ability to copy objects—devices, LAN segments, network nodes, and subnets—from one drawing to the next, editing as necessary, until you have built the entire network. Along the way, you can run various simulations to test virtually any aspect of the design.

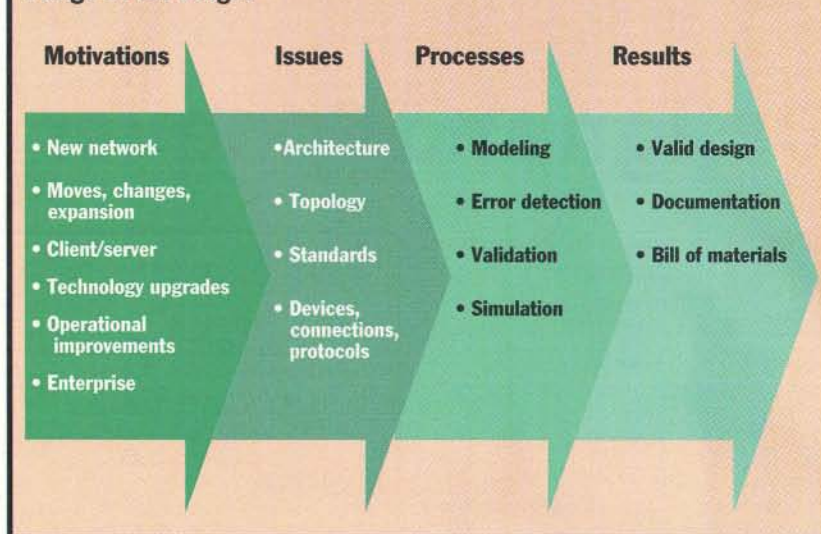
With the right tools, modules, and device libraries, you can design every conceivable type of network, including legacy networks such as Systems Network Architecture (SNA) and DECnet; voice networks including ISDN; and T1, X.25, asynchronous transfer mode (ATM), and TCP/IP nets. Some tools, such as MIL 3's OpNet, let you incorporate satellite, microwave, and other kinds of wireless technologies.

Starting from Scratch

Designing a large, complex network requires a multifaceted tool, preferably one that is graphical, object-oriented, and interactive. It should support the entire network life cycle, from the definition of user requirements and conceptual design to the detailed vendor-specific configuration of network devices, their protocols, and the various links between them. At each phase, the tool should be able to test design alternatives for cost, performance, and validity. When the design checks out, the tool should spew out network diagrams and a bill of materials. All this happens before you contact a single equipment vendor or carrier sales rep or write an RFP.

For administrators embroiled in the complexities of network design, this kind of tool represents a dream come true. ImageNet's prerelease version of CANE, an integrated set of Windows NT applications, comes close to meeting this ideal. Designers can take a top-down or a bottom-up approach to network construction. In the top-down approach, the designer starts by sketching out the overall network, then adds increasing levels of detail until every aspect of the network is eventually fleshed out. The bottom-up approach might start with a LAN in a specific department to which you link subsequent drawings to create the overall network structure.

Design's Four Stages



Large-network design tools can improve and simplify every stage of the design process.

As the drawing window populates, you can further define devices by component type—such as chassis, interface cards, and daughterboards. You can even specify the operating system, such as "NetWare 3.12 client for a Compaq Presario 660 PC." You can add attributes (like protocol functionality) to each device taken from a library. Once you've configured the devices, each device gets a profile that specifies its traffic characteristics for simulating the network's load and capacity.

Having defined each device's configuration, lines between them form the network. CANE then validates the links, testing for common protocols and network functions. This prevents obvious mistakes, such as NetWare clients connecting to other clients instead of servers, for example. This on-line analysis feature also alerts the designer to undefined links, unconnected devices, insufficient available ports in a device, and incorrect addresses in IP networks. An off-line analysis tool reports violations of network integrity and proper network design practices. The designer can analyze the network's structure, its IP completeness, or both at once.

CANE simulates the completed network, using a database that describes how actual network devices behave under various real-world conditions. The simulator generates network events over time, based on the device and traffic pattern

recorded in the simulation profile. The designer can test the network's capacity under various "what if" scenarios and fine-tune the network for optimal cost and performance. Simulation in the pre-release version of CANE operates on one LAN segment at a time. By the time you read this, the commercial version of CANE will support fully integrated enterprise-wide LAN and WAN simulation.

Better Designs, the "Primitive" Way

The Make Systems design package focuses on building WANs. Among the company's set of six core tools in NetMaker XA is the Designer module. Designer allows you to build cost-effective topology and clocking designs—from the ground up or incrementally—using a library of building-block "primitives."

With the time-division multiplexing (TDM) primitives library, for example, you can build an entire T1 network within your specified parameters and constraints. You can strive for the lowest transmission cost that supports all traffic, for instance, or for line redundancy between all the TDM nodes. Each primitive addresses a different aspect of the design. You can run tail circuit design, hub selection, or redundancy primitives as needed. You can combine them to address the overall design objectives. You can pause the design process after each design

STATISTICA

and Windows 3.1
and Windows 95

STATISTICA (automatically configures itself for Windows 95 [long file names, etc.] or 3.1) ■ A complete data analysis system with thousands of on-screen customizable, presentation-quality graphs fully integrated with all procedures ■ Comprehensive Windows support, OLE (client and server), DDE, customizable *AutoTask* toolbars, pop-up menus ■ Multiple data-, results-, and graph-windows with *data-graph* links ■ The largest selection of statistics and graphs in a single system; comprehensive implementations of: Exploratory techniques with advanced brushing; multi-way tables with banners (presentation-quality reports); nonparametrics; distribution fitting; multiple regression; general nonlinear estimation; stepwise logit/probit; general ANCOVA/MANCOVA; stepwise discriminant analysis; log-linear analysis; confirmatory/exploratory factor analysis; cluster analysis; multidimensional scaling; canonical correlation; item analysis/reliability; correspondence analysis; survival analysis; a large selection of time series modeling/forecasting techniques; structural equation modeling with *Monte Carlo* simulations; and much more ■ On-line *Electronic Manual* with comprehensive introductions to each procedure and examples ■ Hypertext-based *Stats Advisor* expert system ■ Workbooks with multiple *AutoOpen* documents (e.g., graphs, reports) ■ Extensive data management facilities (fast spreadsheet of unlimited capacity with long formulas, *Drag-and-Drop*, *AutoFill*, *Auto-Recalculate*, split-screen/variable-speed scrolling, advanced Clipboard support, DDE links, hot links to graphs, relational merge, data verification/cleaning) ■ Powerful *STATISTICA BASIC* language (professional development environment) with matrix operations, full graphics support, and interface to external programs (*DLLs*) ■ Batch command language and editable macros, flexible "turn-key" and automation options, custom-designed procedures can be added to floating *Auto Task* toolbars ■ All output displayed in *Scrollsheets*™ (dynamic, customizable, presentation-quality tables with instant 2D, 3D, and multiple graphs) or word processor-style report editor (of unlimited capacity) that combines text and graphs ■ Extremely large analysis designs (e.g., correlation matrices up to 32,000x32,000, unlimited ANOVA designs) ■ Megabyte Manager with up to 32,000 variables (8 Mb) per record ■ Unlimited size of files; extended ("quadruple") precision; unmatched speed ■ Exchanges data and graphs with other applications via DDE, OLE, or an extensive selection of file import/export facilities (incl. *ODBC* access to virtually all data bases and mainframe files) ■ Hundreds of types of graphs, incl. categorized multiple 2D and 3D graphs, ternary 2D/3D graphs, matrix plots, icons, and unique multivariate (e.g., 4D) graphs ■ Facilities to custom-design new graph types and add them permanently to menus or toolbars ■ On-screen graph customization with advanced drawing tools (e.g., scrolling and editing of complex objects in 32x real zoom mode), compound (nested) OLE documents, *Multiple-Graph AutoLayout Wizard*, templates, special effects, icons, page layout control for slides and printouts; unmatched speed of graph redraw ■ Interactive rotation, perspective and cross-sections of 3D displays ■ Large selection of tools for graphical exploration of data: extensive brushing tools with animation, fitting, smoothing, overlaying, spectral planes, projections, layered compressions, marked subsets ■ Price \$995.

Quick STATISTICA (for Windows) ■ A subset of *STATISTICA*; comprehensive selection of basic statistics and the full analytic and presentation-quality graphics capabilities of *STATISTICA* ■ Price \$495.

STATISTICA/QC - Industrial statistics add-on package (requires *STATISTICA* or Quick *STATISTICA* for Windows) ■ The largest selection of industrial statistics in a single package; quality control charts (compatible with real-time data acquisition systems), process capability analysis, R&R, sampling plans, and an extremely comprehensive selection of experimental design (DOE) methods ■ Flexible tools to customize and automate all analyses and reports (incl. "turn-key" system options, and tools to add custom procedures) ■ Price \$495.

STATISTICA/Mac (for Macintosh) ■ Price \$695 (Quick - \$395).

Domestic sh/h \$12 per product; 30-day money back guarantee.

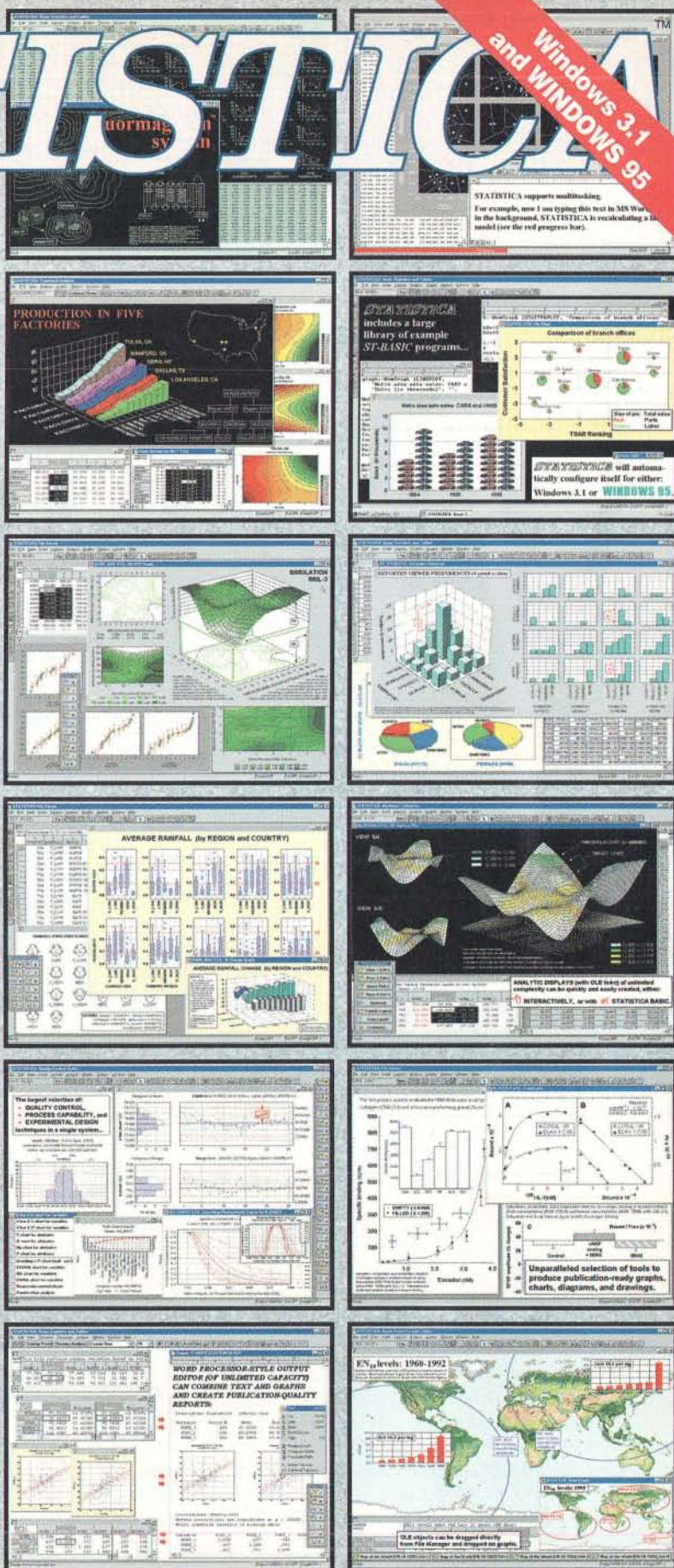
STATISTICA has received the highest rating in EVERY comparative review of statistics software in which it was featured, since its first release.



StatSoft®

2300 E. 14th St. • Tulsa, OK 74104 • (918) 749-1119
Fax: (918) 749-2217 • WEB: <http://www.statsoft.com>
e-mail: info@statsoft.com

Overseas Offices: StatSoft of Europe (Hamburg, FRG), ph: 040/ 4200347, fax: 040/4911310; StatSoft UK (London, UK), ph: 01462/482822, fax: 01462/482855; StatSoft France (Paris, France), ph: (1) 34 52 39 22, fax: (1) 34 52 28 48; StatSoft Polska (Krakow, Poland), ph: 12-391120, fax: 12-391121; StatSoft Italia (Padova, Italy), ph: 49-893-3227, fax: 49-893-2897; Available from other Authorized Representatives worldwide: Australia: Heame, ph: (03) 9602 5088, fax: (03) 9602 5050; Sweden: AkademiData Scientific, ph: 018-210035, fax: 018-210039; Finland: Statsoft Oy, ph: 24-7334678, fax: 24-7333867; Belgium: Texma NewTech, ph: 010 616 628, fax 010 616 957; South Africa: Osiris, ph: 12-660-2884, fax 12-660-2886; Japan (Macintosh): Three's Company, Inc., ph: 03-3770-7600, fax 03-3770-7784; Japan (Windows): Design Technologies, Inc., ph: 03-3668-1110, fax: 03-3668-3110; Taiwan: Intelligent Integration Corp., ph: 2-698-2060, fax: 2-698-2061; The Netherlands: Exstat, ph: (0) 50-5267310, fax: (0) 50-5277665; Russia: SoftLine Corp., ph: (095) 126-9065, fax: (095) 232-0023; Hungary: Chemicro, ph: 1 131-3847, fax: 1 132-9330. StatSoft, the StatSoft logo, STATISTICA, and Scrollsheet are trademarks of StatSoft, Inc.



primitive executes to study the results and adjust network parameters if necessary.

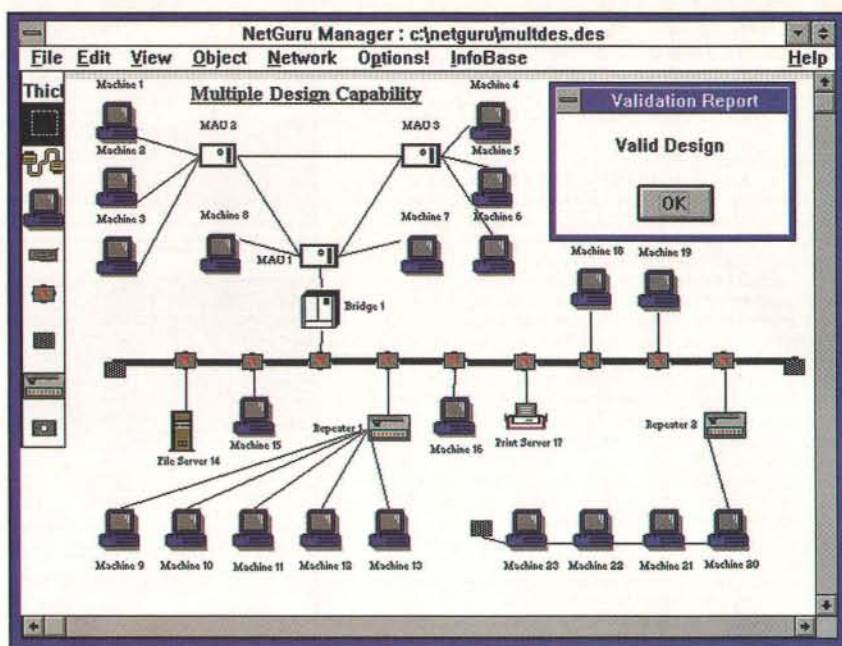
Designer uses Planner (another NetMaker tool) to run device-specific simulations to ensure that the network design is feasible and will route all traffic successfully. Since the simulation is vendor-specific (via plug-ins) there is less chance that the network will be overbuilt just to guarantee the handling of all traffic. A tariff database can price transmission links and determine the most economical network design.

The Modeling Approach

Sometimes it's best to approach unfamiliar territory by scoping out the terrain before committing time and resources to development; this strategy is especially helpful with large networks. Perhaps you want only to assess the feasibility of implementing a certain type of network by playing with a model's various design issues and evaluating the consequences for your organization. MIL 3's OpNet provides standards-based protocol models against which simulations can run within its multilevel development environment. Its model libraries let you do this with a variety of network technologies including frame relay and ATM.

Frame relay, with efficient statistical multiplexing of data and low overhead, has gained broad acceptance in large networks. As frame relay supplements—and replaces—legacy technologies such as X.25 and TDM, important issues arise. These issues include the benefits of frame relay versus the benefits of existing network technology, its use with other emerging technologies such as ATM, and its interoperability with higher-level protocols such as TCP/IP.

OpNet's frame relay models let you build entire networks—complete with configurable objects such as routers, switches, and access devices—so you can study their behavior in great detail. The switch model, for instance, supports the creation of routing tables, switching rate, and buffer capacity for each outgoing link. Among the parameters that can be applied to the permanent virtual circuits (PVCs) are the committed information rate (CIR), committed burst size (Bc), and excess burst size (Be). Incorporating such details into the design allows you to study a variety of network alternatives and assess the impact of new features such as switched virtual circuits (SVCs).



Each item drawn in NetGuru is an intelligent icon that references information for network design, validation, and simulation.

Despite their embedded intelligence, CANE, NetMaker, OpNet, and other stand-alone design products lack the comprehensive automatic discovery capabilities found in heavy-duty management platforms. Hewlett-Packard's Open View, IBM's NetView/6000, and Sun's Solstice SunNet Manager automatically detect various network elements and represent them with icons on a topology map. Stand-alone products are better suited for creating new large-scale networks than for changing existing ones, at least for now.

Still, the shape of things to come is apparent in Make System's NetMaker XA 2.5, which can automatically discover frame relay PVCs. Expect autodiscovery to be the next development focus of independent tool makers in the coming year. Meanwhile, high-end stand-alone products still offer more advanced design capabilities. They incorporate a broader range of network technologies and equipment makes and models than the design tools that come with network management systems.

Bargain Power Tool

Developing a large-scale network does not always require high-priced design tools. To plan a large network that has thousands of PCs, workstations, and servers attached to hubs—interconnect-

ed via bridges or routers over IP networks—you could, for example, use American Hytech's NetGuru, a \$495 package that runs under Windows 3.x.

NetGuru allows network professionals to design, validate, and document LANs of any size, including ARCnets (see the screen above). It validates a network design based on standards—or de facto standards—with an internal rule-checking knowledge base that you can invoke at any time. The validation ensures that all network components are accounted for—including network interface cards, converters, terminators, transceivers, multistation access units (MAUs), bridges, repeaters, routers, hubs, and different cable types—before you start building a network or making additions to one. If a device is misconfigured or a 10Base-T wire exceeds the IEEE standard length, for example, NetGuru alerts you. For the truly adventurous, the program has an expert mode that allows experienced designers to override standards and push the envelope.

NetGuru can be used to design only LANs and large-scale IP networks—not WANs that include TDM, frame relay, ATM, or wireless technologies. Nevertheless, the program has many features of higher-priced packages, including object orientation and device libraries, drag-and-drop component assembly,



GO GET THEM!

Yes, you can. NOW, you can excel, superperform and meet all your client's needs or your very own in a flash. Power on MITAC's workstation 'TD6600N' with an **Intel Pentium® Pro processor** and delve into the thrill of speed and superpower.

Running at **200MHz**, and supporting upto **256MB of DRAM**, the TD6600N is the ideal workstation for memory-hungry and speed-starved operations such as CAD, intense DTP, graphics, design and other heavy-duty 32-bit applications.

Expandability. Supporting both the USB and ATX protocols, as well as 4 PCI and 4 ISA slots, MITAC's TD6600N offers more function integration, multiple connections on a single bus, and great flexibility. The TD6600N also supports upto 3 hard disks concurrently, giving you more than 6GB in one desktop machine!

To crown its claim of the ultimate workstation, MITAC's TD6600N also comes with crystal audio CODEC [optional], 16-bit stereo, Soundblaster-compatible full duplex audio as well as 3D S3 Virge graphics capabilities and supports fax-IrDA and Consumer Infrared interfaces. MITAC's brawny workstation is shipped preloaded with the powerful **Windows NT** ready to run.

Now **reliability**. MITAC's TD6600N not only supports error checking and correction [ECC] but you can rest assured of the MITAC value-added quality, reliability and stability that many in the PC industry have come to rely on for so many years now.

Longing for real power, speed and hyperformance? Ask for your MITAC TD6600N today.



MITAC



COMDEX Fall '96
Visit Mitac at Hall S-2, L2435

■ MITAC INTERNATIONAL CORP. Lin Kuo Office -- Tel:886(3)3289000 Fax:886(3)3280928
■ E-mail: market@srmlink.mic.com.tw ■ (URL): <http://mitac.mic.com.tw>

The Intel Inside Logo and Pentium are registered trademarks and the Pentium Processor Logo and the Pentium Pro Processor Logo are trademarks of Intel Corporation.

simulation capabilities, network documentation, and bill of materials support. An advanced Boolean search engine helps you locate any database element.

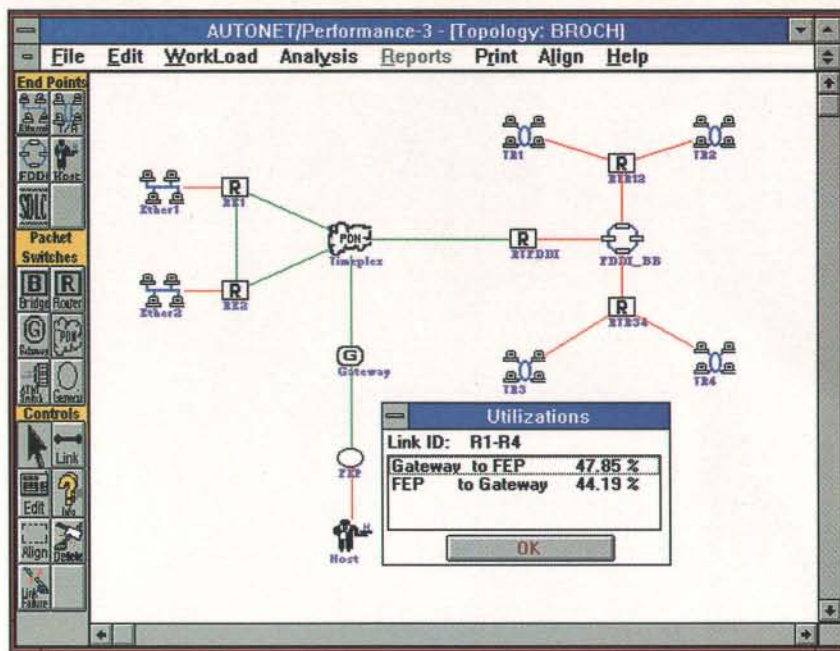
Web-Accessible Tools

The Web, besides extending help desk support, configuring and monitoring network devices, accessing network performance data, and enabling and disabling device operations, can also assist with network design.

NetSuite development tools help network professionals design and draw a mammoth network and publish their designs on the corporate intranet or the public Internet. Any authorized user can view them with a Web browser. NetSuite DesignView converts network designs and device details developed in NetSuite Professional Design into hyperlinked Hypertext Markup Language (HTML) documents with device configurations, port usage, and even device photographs. Users can easily navigate from device to device to trace connectivity and review device configurations. Besides supporting fault identification, the hyperlinked documents can be useful when you have to plan design changes.

Achieving specific design objectives requires properly configured equipment at each node. Calico Technology provides a product configurator that interconnect vendors can use to help their systems engineers, value-added resellers, and large customers accurately configure complex, built-to-order products such as routers and hubs.

Cabletron and Cisco are two of the companies that use the Calico Configurator. For example, authorized users can access Cisco's Configurator Agent page on the Web, search for configurable products, choose a particular model, and configure it. A Cisco 7000 backbone



Network Design and Analysis's AutoNet/Performance-3 offers simple graphical design tools and analysis functions.

router, for example, can be configured for software options, power supply, power cables, memory, route and switch processors, and interface modules. Error messages flash on screen to indicate if you've picked a particular equipment configuration that's invalid, and suggestions help you pick the best configuration. The controls on the page allow you to then send the order to Cisco.

Not Quite Rome in a Day

In simpler days, network gurus kept information systems and networks operating smoothly with all configuration details tucked away in their gray matter. Today, systems are distributed and networks are going global. With intelligent hubs, switched LANs, sprawling router networks, broadband facilities, and

advanced services like frame relay and ATM in the mix, large-scale networks are beyond mere human comprehension.

A new generation of intelligent design tools with built-in error detection, simulation and analysis, and plug-in function modules, has finally arrived. Managers and planners needn't be intimately familiar with every aspect of their networks. You can retrieve essential information instantly—often with point-and-click ease—then analyze, query, manipulate, and reanalyze that information if necessary. You can display the results in easy-to-understand graphics or export it for further study. Since products differ in the type and scope of data they provide, tools from different vendors may be necessary. Ultimately, the quality and completeness of the data determine the optimal network design.

With these powerful and intelligent new network design tools, you still may not be able to build Rome in a day. But you at least have a chance to build a solid foundation. **B**

Nathan J. Muller, based in Huntsville, Alabama, writes extensively about computers, communications, and management. Among his latest books is Network Planning, Procurement & Management, published by McGraw-Hill. You can reach him by sending e-mail to nmuller@ddx.com.

WHERE TO FIND

American Hytech

Pittsburgh, PA
(412) 826-3333
fax: (412) 826-3335
<http://www.fyi.net/~netguru>

ImageNet

Wellesley, MA
(617) 239-8197
fax: (617) 239-8198
<http://www.imagenet-cane.com>

MIL 3

Washington, DC
(202) 364-4700
fax: (202) 364-8554
<http://www.mil3.com>

Network Design and Analysis

Markham, Ontario, Canada
(905) 477-9534
fax: (905) 477-9572
<http://www.ndacorp.com>

Calico Technology

San Jose, CA
(408) 975-7400
fax: (408) 975-7410
<http://www.calicotech.com>

Make Systems

Mountain View, CA
(415) 941-9800
fax: (415) 941-5856
<http://www.makesys.com>

NetSuite

Wayland, MA
(508) 647-3100
fax: (508) 647-3112
<http://www.netsuite.com>

Best answers

6 days ago you had
important data.
3 days ago you
had a power spike.

Now you have a problem.

**Bad power can
corrupt *all* the files
on a UNIX system.**

And that's not all. Power problems can also cause network and hard drive crashes, read/write errors, corruption or loss of data, faulty data transmissions, system lock-ups, premature failure of components and more.

Best Power products are your answer. They *clean up dirty power* before it reaches your

equipment, which can reduce your computer and network downtime up to **80%***. And if you have a blackout, they provide backup power to shut down your system correctly.

And now, every Best Power Single-Phase UPS comes with *free software*, providing power monitoring and unattended shutdown for your entire computing environment.

So call Best Power for your power protection answers.

Internet: <http://www.bestpower.com>

Dubai: +9714 484 645
Germany: +49 9131 77700
Italy: +39 2 6600661
Switzerland: +41 56 2019595
UK: +44 1962 844414

*A five-year power quality study conducted by Best Power's National Power Laboratory showed that the number of calls for computer service dropped 82% after installation of a UPS.



Best 510 Uninterruptible Power Systems
(Includes Free Software)



The Answer in Power Protection

Switch to any Server by Name from an On-Screen Display!



Now, switching computers with your AutoBoot keyboard/video/mouse switch is even easier. Just call up the Director menu, choose a computer and you're done! No buttons to push or codes to remember. Since you name your computers whatever you like, picking one from the menu is a snap. Keep your current computer name on screen at all times, or for just a few seconds after switching.

Best of all, the Director works with any platform, operating system or software you use. All you need is a Commander product with keyboard control capability. And, because it's an add-on product to your existing Commander, there's no software to install.

With the Director, making the switch to Cybex is easier than ever!



COME SEE US AT
Networks Expo in Dallas, TX Oct. 29-31 Booth #1591
COMDEX/Fall '96 in Las Vegas NV, Nov. 18-22 at Booth #L4254



Cybex Computer Products Corporation
4912 Research Drive • Huntsville, AL 35805 USA
1-800-932-9239 • FAX (205) 430-4030
<http://www.cybex.com>

PC is a registered trademark of International Business Machines Corp. Macintosh is a registered trademark of Apple Computer, Inc. Sun is a trademark of Sun Microsystems. Cybex, Commander, AutoBoot and 4xP are trademarks of Cybex Computer Products Corporation.

Dealer Program Available

Made in USA

Commercial tools help system administrators manage traffic jams and avoid downtime. By Charles D. Knutson

Building the Model Network

How do you efficiently design, build, grow, and manage huge networks without being able to automatically model and simulate them? Answer: not very easily.

Modeling is based on the existing large network. A good model can show you nooks and crannies, and their technical features, where you never even knew you had nooks and crannies. Modeling captures the network in a static or a dynamic snapshot for further analysis. What kind of analysis? Let's say you're considering new topologies. You might want one clear diagram of your until-now ad hoc accretion of network segments. You will probably also want to test aspects of network capabilities: Testing exercises network components to find their limits.

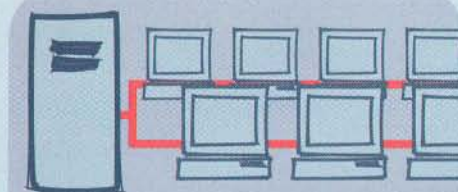
Simulation uses the network as a base, then goes off into the what-if world that's essential for planning. Naturally, designing large networks (see "Design and Conquer" on page 93) involves simulation, and maintaining networks (see "See the Big Picture" on page 107) involves testing. System administrators are in the tricky position of trying to satisfy everyone on their big network. Here are some automation tools that can help administrators deliver satisfaction.

Good Models Make Good Networks

To manage a complex network and avoid system degradation and downtime, it's critical to have a view—a model—of what the network looks like. When big nets go down or slow down, companies lose big money. That's where a good model comes in. Like a road map when you're hopelessly lost and late, a detailed network model can simplify and speed solving network hang-ups. Without a detailed network model? You could be hosed before you know what hit you. As Bob Ross, president of LAN Utilities (Pleasant Grove, UT), developers of LAN test tools, says, "The self-perception of administrators is that they deal with

Find Solutions Through "What If" Simulations

Problem: Too many requests per minute to the server.

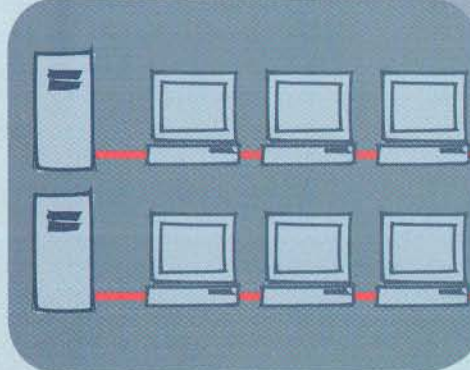
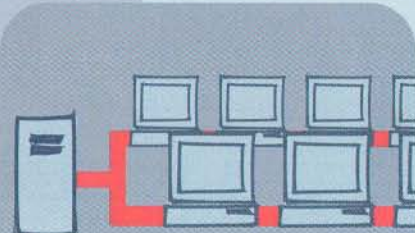


Scenario 1: Add a larger and faster file server.

Analysis: Short-term solution; problem will resurface in eight months at current network growth rates.

Scenario 2: Use higher-speed connections.

Analysis: Retrofitting costs are prohibitive.



Scenario 3: Divide the network into smaller segments.

Analysis: Solves current problem, provides for scalability.

One of the most valuable things about simulation tools is they let you try out different "what if" solutions to network problems.

problems within 20 minutes, but that's only after they find out about them."

Luckily, there are tools that can help create detailed and useful models of even the most arcane and far-flung nets. Pin-Point Software continues to improve ClickNet, its network-diagramming product that allows administrators to customize graphic views of a network. It interfaces with network management packages (including Seagate's LAN Directory for Windows and McAfee's Saber

LAN Workstation), can download information (about cable configurations; types of workstations, servers, hubs, and routers; and mission-critical software packages), and can automatically generate a graphic model of the network.

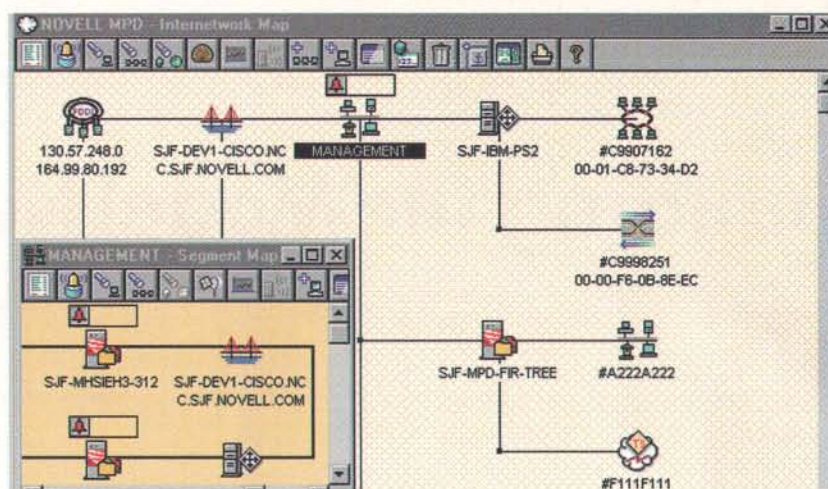
While Visio's Visio Technical 4.0 and Visio Shapes for Network Equipment may provide more powerful drawing capabilities—drag-and-drop diagramming, clean interface, and ease in aligning and moving objects without breaking

connections—they can't directly import information from network management packages. One of the more impressive and intelligent network-diagramming tools is Quyen Systems' netViz. Besides powerful drawing capabilities, netViz automatically discovers and displays information about nodes on a Novell network, identifying servers, workstations, and volumes. Automatic discovery does not rely on some earlier (and possibly out-of-date) database of network information. The larger the network, the more critical automatic discovery is for developing an accurate and useful model of that network for testing or simulation.

These diagramming tools ultimately deliver a static model of a system, which can help an administrator design and implement a network, understand the complexity of an existing one, and suggest areas that might become problematic. But nothing beats real-time information displayed graphically. Novell's ManageWise 2.1 allows administrators to model (and also manage) a network from a central location (the console runs under Windows 95 or Windows 3.1). ManageWise can discover and map all network devices and inventory the current hardware and software of workstations and servers, creating a dynamic model of the network. And not just for Novell's NetWare. ManageWise can also integrate with enterprise consoles such as IBM's System View for AIX, HP's OpenView, and Sun's Net Manager. The result is the ability to see at a glance when printers, servers, hubs, and routers die. Just as important, ManageWise tracks and displays network performance and warns when system behavior might suggest impending problems. ManageWise supports many snap-in applications, such as DenMac's Alert Pager, which immediately informs net supervisors of problems. That means an administrator on the golf course can receive a pager message with the news that a key server has died—unpleasant as golf rounds go but essential for limiting network downtime.

Good Simulation Means Better Testing

A network simulation builds on a model, then brings it to life. Like a model train layout, a network simulation gets all the make-believe traffic moving, all the imitation lights blinking, and all the artificial crack-ups resulting. This is especially cru-



Novell's ManageWise 2.1 dynamically discovers and graphically displays all network devices for modeling and managing.

The screenshot shows the 'All NetWare File Servers' window in Novell's ManageWise 2.1. It displays a table with columns for 'Server Name', 'Alarm', and 'Manageable'. Below the table, it shows statistics: 'Servers: 163', 'Manageable: 93', and 'With Alarms: 29'. Below this is another window titled 'ManageWise Agent for Windows NT Server - [All Windows NT Servers]' which also displays a table with columns for 'Server Name', 'Alarm', and 'Manageable'. Below this table, it shows statistics: 'Servers: 5', 'Manageable: 5', and 'With Alarms: 2'.

Server Name	Alarm	Manageable
SVL-MWC	n/a	yes-old agent
SVE-ALPHA	n/a	yes-old agent
S.J.F-NID-MKTG	n/a	yes-old agent
SVE-MAC	n/a	yes-old agent
S.J.F-WYIN410	critical	yes

Servers: 163 Manageable: 93 With Alarms: 29

Server Name	Alarm	Manageable
JOKOM_TEST_2		Yes
CRUISER		Yes
NXP-NTAS	critical	Yes
MING-NT1	minor	Yes

Servers: 5 Manageable: 5 With Alarms: 2

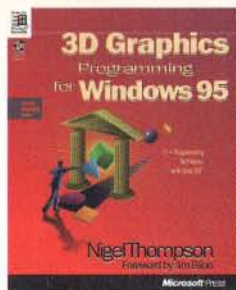
ManageWise also summarizes network configurations and sounds the alarm when system behavior goes awry.

cial with large networks, since no mere mortal can keep the whole conglomeration straight in his or her mind. With a good simulation, you can spot bottlenecks, buildups, and backups. Simulation is also a valuable basis for testing, since you can try things out on the simulator before flying the real fighter jet.

Unleashing new applications or new changes on an unsuspecting large-scale network can be disastrous. Developers especially face this problem. "That's one thing I've definitely found," says Ross. "In a development environment, usually you're fairly sequestered. It's usually not that busy of a network. So the engineers typically are developing on this

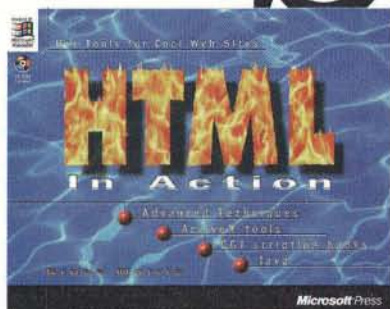
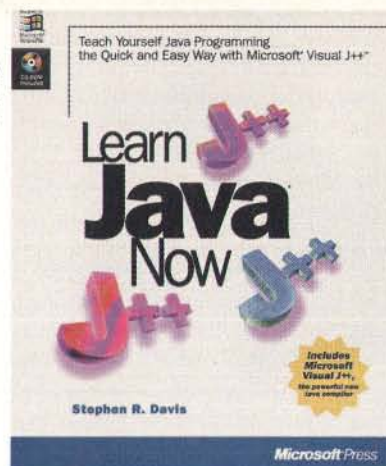
quiet net, and then you throw the software onto a production environment and it goes berserk." New applications may also face mysterious and temperamental real-time problems—sneaky bugs that appear only at certain times of the day or under certain kinds of traffic loads. The hardest part of crushing these bugs is recreating them. To do that, the system administrator has to be able to replicate not just traffic volume but particular kinds of traffic.

So how do you adequately test a client/server application product that has never seen a really ugly network? Build your own ugly network! Chariot, from Ganymede Software, is a tool that can



3D Graphics Programming
for Windows 95
1-57231-345-5 \$34.95 U.S.

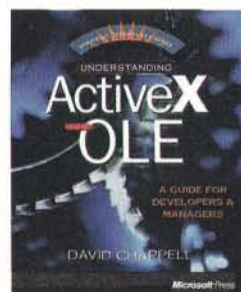
Learn Java Now
1-57231-428-1
\$39.95 U.S.



HTML in Action
1-55615-948-X
\$29.95 U.S.

Get better net results.

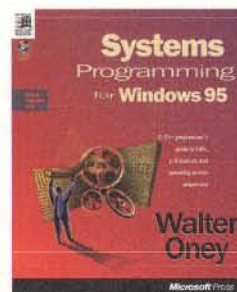
You're ready to develop applications for the Internet or for Windows® 95. Make them pay off. Teach yourself the secrets of Java™ programming the quick and easy way. Use hot tips to build cool sites with HTML. Make sure you understand ActiveX™ and OLE. Use MAPI to build robust messaging and workflow components. Dive deep into Windows 95. Create cool 3D effects that run without souped-up hardware! Do it all. Set your sights high, and help things along with Microsoft Press® books from your favorite bookstore or software store—the smartest way to get the best net results from every application.



Understanding ActiveX and OLE
1-57231-216-5 \$22.95 U.S.



Inside MAPI
1-57231-312-9
\$39.95 U.S.



Systems Programming
for Windows 95
1-55615-949-8 \$39.95 U.S.

Microsoft® Press

Available in quality bookstores and computer stores worldwide

To locate your nearest source for Microsoft Press products, reach us at: www.microsoft.com/mspress/
1-800-MSPRESS in the U.S.



simulate the traffic of client/server applications. Using Chariot, you can force a server to handle many concurrent requests from "clients" artificially made by the simulator—for a fraction of the cost of doing it live on multiple hardware platforms. CenterLine Software's QC/Sim has other nifty features for creating ugly environments in which to test distributed software. Operating as an add-on to QC/Coverage, a code-testing product, QC/Sim can fake scenarios that are difficult to replicate in practice, like

network failures, limited disk capacity, and other real-life horror stories.

Bringing It All Together

In an ideal world, you would buy your whole network from a single vendor, with one perfect modeling and simulation product. But in reality, your huge network has probably snowballed until it seems to have a life of its own. "Larger organizations with multiple deployed offices don't go to Ford and buy," observes Bill Gillman, vice president of

operations at Gentner Communications Corp. (Salt Lake City, UT), a manufacturer of telecommunications equipment. "They go to the store and pick some NAPA parts and some GM parts and some Ford parts, and they build their own custom car." As a result, the average system administrator has a nearly impossible task. You need a product that can, first, create a model of your patchwork network and, second, let you simulate what-ifs to that network. So what do you do?

You must zealously identify the tools that can grasp your network's complexities, then assemble those tools into a system that works. Large networks are built out of disparate hardware platforms, operating systems, and applications, and managing them is a daunting adventure. Without the right tools, it's downright impossible. **B**

Charles D. Knutson owns ComSoft Consulting in Corvallis, Oregon. In a previous life he was a system test manager for NetWare Client Products at Novell. You can e-mail him at cknutson@csconsult.com.

WHERE TO FIND

CenterLine Software
Cambridge, MA
(800) 669-2687
(617) 498-3000
fax: (617) 868-6655
<http://www.centerline.com>

DenMac
Northbrook, IL
(800) 315-0952
(847) 291-7760
fax: (847) 562-0013
<http://www.denmac.com>

Ganymede Software
Research Triangle Park, NC
(919) 558-1138
<http://www.ganymede.nctda.org>

Novell
Orem, UT
(800) 453-1267
(801) 222-6000
<http://www.novell.com>

PinPoint Software
San Jose, CA
(800) 599-3200

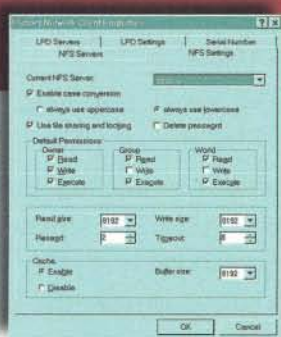
(408) 997-6900
<http://www.pinpt.com>

Quyen Systems
Rockville, MD
(301) 258-5087
fax: (301) 258-5088
<http://www.quyen.com>

Visio
Seattle, WA
(800) 446-3335
(206) 521-4500
<http://www.visio.com>

Distinct NFS 95™

Easiest way to Share Files, Programs and Printers



Highlights:

- Integrates seamlessly into Windows 95
- Mounts NFS drives from Explorer or Network Neighborhood
- Supports file and record locking
- Allows central authentication with a single server running PCNFSd for all NFS connectivity
- Prints to NFS or LPD print servers
- Allows login to all systems with a single login name and password or different login names for each system
- Allows single-operation logout of all systems accessed through Network Neighborhood
- Fine tunes performance parameters for each server you access

Free Evaluation Copy Available at...



distinct
The world leader in Internet development tools.

408.366.8933
<http://www.distinct.com>
Fax: 408.366.0153
E-mail: byte@distinct.com
Fastfacts: 408.366.2101

Distinct IntelliTerm™

Integrated Terminal Emulator for DEC and IBM® Systems



Highlights:

- TN3270 Emulation—Models 2,3,4 and 5 (for IBM Mainframes)
- 3179G Vector Graphics & 3279S3G
- TN5250 (24x80, 27x132) (for AS/400)
- VT52, VT100, VT220, VT320 & VT420 emulation (for DEC and UNIX Systems)
- Customizable keyboard layouts, poppads and session profiles
- VBA™ Advanced Scripting Language
- DDE, HLLAPI, EHLLAPI, WinHLLAPI and Visual Basic™
- Available for Windows 3.11, Windows 95 and Windows NT

Free Evaluation Copy Available at...



distinct
The world leader in Internet development tools.

408.366.8933
[WWW: http://www.distinct.com](http://www.distinct.com)
Fax: 408.366.0153
E-mail: bytemag@distinct.com
Fastfacts: 408.366.2101

Best answers

Today,
millions
of people will experience
their worst nightmare.

**They will lose presentations and
reports to a computer crash.**

**They will blame their
software or hardware
when a power problem
is really responsible.**

Power problems can also
cause network and hard drive
crashes, read/write errors, cor-
ruption or loss of data, faulty
data transmissions, system
lockups, premature failure of
components and much more.

Best Power products are your
answer. They *clean up dirty
power*, which can reduce your
computer problems by up to
80%.* They also provide
backup power to shutdown
gracefully in a blackout.

**And now, all Best Power
Single-Phase UPSs come
bundled with free software,
providing power monitoring
and automatic unattended
shutdown for your system.**

Don't take unnecessary risks.
Call Best Power for your
power protection answers.

Internet: <http://www.bestpower.com>

Dubai: +9714 484 645
Germany: +49 9131 77700
Italy: +39 2 6600661
Switzerland: +41 56 2019595
UK: +44 1962 844414

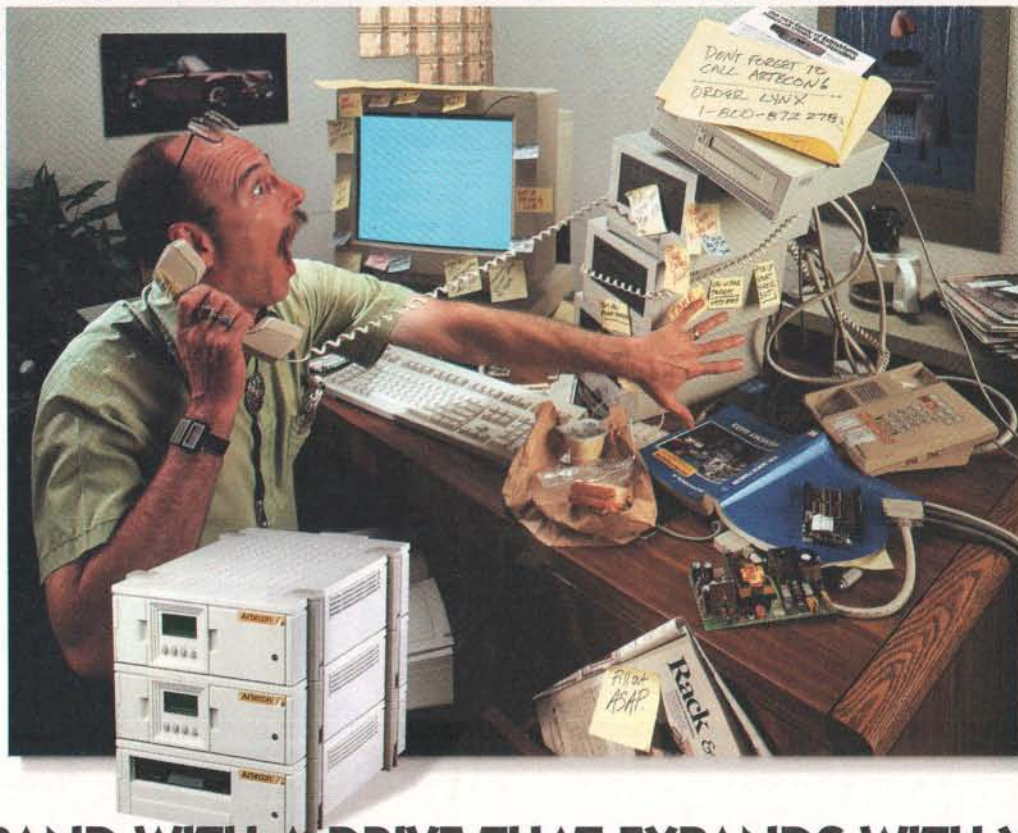
*A five-year power quality study
conducted by Best Power's National
Power Laboratory showed that the
number of calls for computer service
dropped 82% after installation of a UPS.



Patriot® Uninterruptible Power Systems
(Includes Free Software)



STORAGE NEEDS GETTING A LITTLE OUT OF HAND?



EXPAND WITH A DRIVE THAT EXPANDS WITH YOU.

- Interlocking stackability
- 1MB - 4GB disk capacities
- Fast-narrow and fast-wide
- 4mm DAT, and 3.5" floppy device options
- 8mm, CD-ROM, and QIC 5.25" options
- AC and SCSI jumpers replace external cables
- Optional LCD and keypad
- Optional hot plug removable drives, front removable power supply
- Supports Sun, HP, SGI, IBM, Mac and other PC platforms

ARTECON introduces *Lpux* the new standard in SCSI peripheral technology. *Lpux* is a revolutionary mass storage subsystem, one that finally matches the technological advances of PCs, workstations and devices stride for stride. Ease of use and reliability are inherent in its visionary design.

Features such as interlocking stackability, external SCSI and AC jumpers, and internal printed circuit cards instead of SCSI cable are all standard. SCSI bus length can now be measured in inches rather than feet. And at an extremely compact size of 2.6"(H) x 6.75"(W) x 10"(D), *Lpux* will clean up your desktop too.



What's more, *Lpux*' basic value and performance is available at the same prices as so called 'standard' subsystems. A rich set of options includes front-panel LCD and keypad for disk information display and setting, true hot plug removability and a front removable power supply for ease of service.

Disk capacities range from 1MB to over 4GB in a single enclosure. And *Lpux* supports other 3.5" and 5.25" half-height devices too, such as tape, optical and floppy drives. All together, the *Lpux* family of subsystems represents the new standard in mass storage. Anything less is now sub-standard. Give us a call - we can help you get your mass storage needs back in hand.

1-800-USA-ARTE

www.artecon.com

email: sales@artecon.com

Enterprising solutions for your enterprise.™

Artecon



PO Box 9000, Carlsbad, CA 92018-9000

(619)931-5500 FAX (619) 931-5527

email: sales@artecon.com

A Member of the Nordic Group of Companies

Artecon Canada (416) 487-7701 ▲ Nihon Artecon 81-03-5458-8260 ▲ Artecon Europe 31-53-4832208 ▲ Artecon France 33-1-69-1818-50 ▲ Artecon U.K. 01344-874301
Artecon and the Artecon logo are registered trademarks of Artecon, Inc. All other trademarks are proprietary to their respective manufacturers.

Circle 180 on Inquiry Card.

State of the Art

Tracking thousands of users—and the related troubleshooting—can be made simpler with the right tools. By Tim Wilson

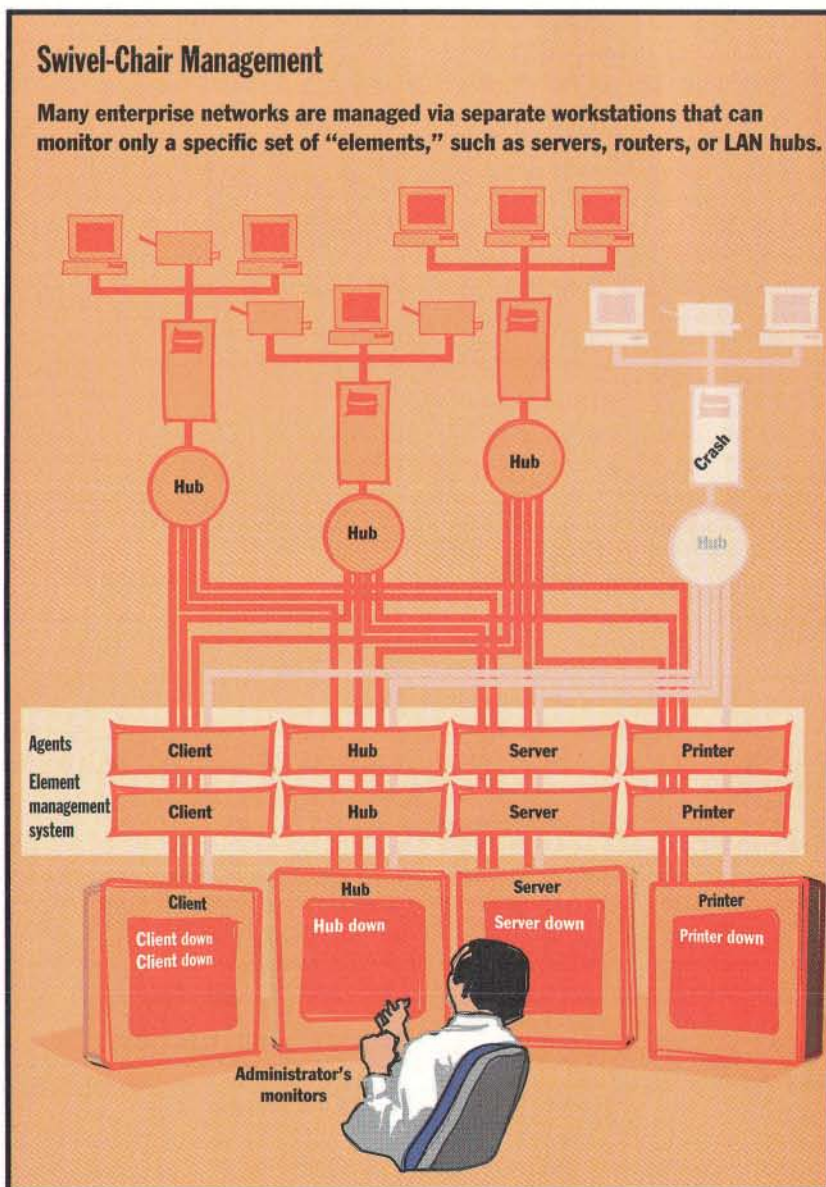
See the Big Picture

If you manage a large network, your job description is simple: Keep your organization's network up and running 24 hours a day, seven days a week, preferably at peak performance. Do a good job, and no one even knows you're there. But if the network crashes, it could cost your organization thousands, even millions, of dollars in lost business and productivity. And you could lose your job. (Gulp!) The task is much like piloting an airplane: hours of boredom punctuated by moments of sheer terror.

You can boil down your job description to a simple axiom: Uptime good, crash bad. That sounds simple enough. It's actually not too much different from managing a 10-node LAN, except that you can't use Norton Administrator to troubleshoot a 20,000-node network that spans 15 countries and includes everything from IBM mainframes to laptops and from multiprotocol routers to T1 multiplexers. For this job you need software with a little bit more power—what has now become known as an *enterprise management system*.

IBM, in the mainframe-oriented heyday of the 1980s, was the first company to develop an enterprise management system capable of monitoring and controlling networks consisting of thousands—even tens of thousands—of hosts and terminals. That software package, called NetView, opened up a new range of applications that ranks today as one of the data communications industry's hottest markets, which includes competitors from powerhouses such as Computer Associates, Digital Equipment, Hewlett-Packard, and Sun Microsystems.

This emerging range of enterprise management applications has changed significantly over the past decade, creating new capabilities that enable network administrators to monitor and control remote computers and other devices. But many managers of mega-networks, whose jobs are on the line, say the tech-



nology has not evolved rapidly enough for their liking.

Setting the Standard

The problem, MIS executives say, is that most so-called network management tools—such as Cisco's CiscoWorks and Novell's ManageWise—are designed to manage only particular devices or sys-

tems, such as routers and LANs, in the enterprise, not the entire network. These applications (collectively known as *element management systems*), which include modem, hub, and multiplexer management systems, gather data about the operating status of specific types of network devices (e.g., LAN servers, routers, and hubs) and display it on a Unix work-

station or PC monitored by the network administrator.

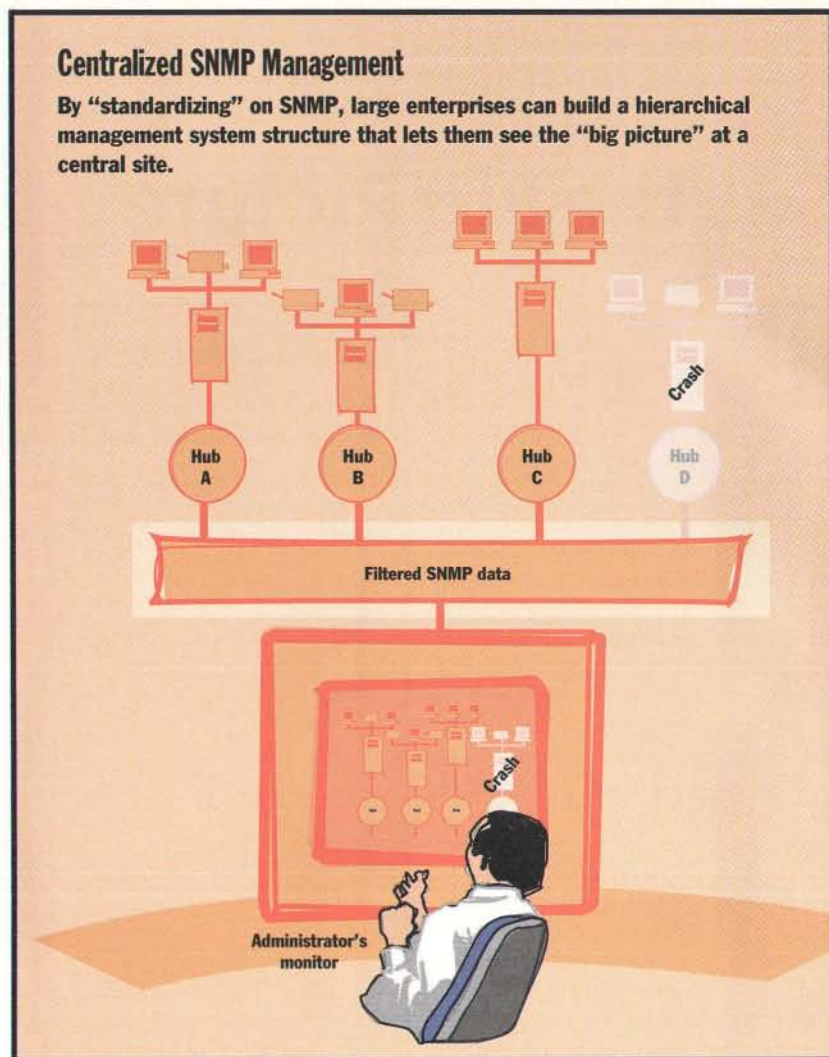
Element management systems typically are included with network devices, which means that the corporate network administrator who manages equipment purchased from many different vendors might have as many as 100 different consoles to monitor. This has created a need for "swivel-chair network management": the act of swiveling or rolling one's chair among many different consoles in an effort to locate the genesis of a network failure (see the figure "Swivel-Chair Management" on page 107). It's kind of like walking around with binoculars strapped to your head; you can see one focused area, but you can't step back and look at the whole picture.

Enter the enterprise management platform, usually a high-powered Unix-based workstation that can run many element management system applications simultaneously. The goal of the enterprise management platform is to provide a single workstation (or group of workstations) that can run many different element management applications and, ultimately, integrate the data from these applications to provide a "big picture" view of the entire enterprise network.

A good idea? Definitely. The problem is that not all element management systems speak the same language or report their status information in the same format. A standard protocol for transmitting and handling network management information is required. Most network devices today use SNMP, a standard published in 1992 by the Internet Engineering Task Force (IETF), the same body that sets guidelines for the Internet.

SNMP defines a method for collecting and formatting information about the devices to be managed through a small piece of software known as an *agent*. An SNMP agent can be installed on any intelligent device. Non-SNMP devices can be managed through *proxy agents* that translate any kind of status information sent to an intelligent agent.

Today, most network devices come with built-in SNMP agents that let them transmit status information to an SNMP-based management system. An administrator sitting at the console of one of the more popular SNMP-based enterprise management platforms, such as HP's OpenView and Sun's SunNet Manager, can gather and correlate data from a vari-



ety of SNMP-compliant devices and systems. This provides a broader view of the topology and status of the entire network (see the figure above). Most smaller networks do not require SNMP because they don't have the wide variety of hardware and software required in big networks.

Under Construction

Over the past several years, SNMP agents have been added to many network devices, and enterprise management platform vendors have been improving their products as they fight a pitched battle for industry leadership. Yet despite these steps forward, many corporate network administrators say they're still far from their goal of developing a common set of tools for enterprise management.

One problem is that many network elements still cannot be managed by SNMP. For example, most firms haven't scrapped their mainframes, which generally em-

ploy IBM's Systems Network Architecture (SNA) protocols. These SNA networks cannot be fully monitored via SNMP, which leaves huge blind spots in the network administrator's view of the enterprise. Similar problems occur at the LAN level, where companies such as Microsoft and Novell have only recently begun to deploy SNMP in their server products.

To complicate matters, many network administrators now find themselves responsible for managing not only the corporate network but also the hardware and software at the end of each link. Increasingly, systems and applications management are tied to network management, but only network devices typically have built-in SNMP agents.

In addition, many administrators have been disappointed thus far with the lackluster performance of SNMP-based enterprise management platforms. One of the most important problems is a lack of scal-

Best answers

While
you take

30 minutes
for a sandwich,

**a blackout eats your
network for lunch.**

Every Best Power
Single-Phase UPS
comes with free
unattended-shutdown
and monitoring software.

What happens if you're away
from the office when an out-
age hits, even with a UPS?

Best Power unattended-
shutdown software is the
answer. In a power emer-
gency, it can page or

e-mail you, notify users of
impending shutdown, close
your system properly and
allow remote monitoring.

Plus, it's completely free.
Many UPS makers will tell
you their software's free
and just raise their prices.
But Best Power bundles **free
software on CD-ROM** with
every Single-Phase UPS, or
you can download it from
the Internet.

So call Best Power for your
power protection answers...
and free software.

Internet: <http://www.bestpower.com>

Dubai: +9714 484 645
Germany: +49 9131 77700
Italy: +39 2 6600661
Switzerland: +41 56 2019595
UK: +44 1962 844414



Patriot® Uninterruptible Power Systems
(Includes Free Software)



ability. Initial releases of several SNMP platforms—including offerings from HP, IBM, and Sun—were based on a single Unix server that couldn't share information with other management servers.

"In that world, you could see the entire environment, but only if it was small," explains Andy Vanagunas, product manager for HP OpenView. "In the larger environments, it was a little like driving with your windshield half-covered."

Under these limitations, the so-called enterprise management platforms could realistically manage only around 1000 nodes—only a slight improvement over some higher-powered LAN management systems. Although some vendors—notably Cabletron Systems, Groupe Bull, and HP—have fixed this problem to provide high scalability in current releases, many potential buyers are still stinging from the failure of those early releases to meet their high expectations.

Another deficiency in many currently available enterprise management platforms is the absence of communication between element management applications running on the same platform. While administrators may have reduced the number of consoles to be monitored, they still must correlate in their heads the data gathered by multiple applications.

For example, a router failure on a network might terminate communications with 100 systems attached downstream from that router. Sitting at the SNMP enterprise management console, the network administrator is suddenly swamped with 101 alarms that indicate a system failure. Yet only one is the cause of the problem; the other 100 are only symptoms. In many cases, it's left to the network administrator to determine which is which.

This problem has created a niche market for management software that can correlate network events and present the administrator with root-cause information. This correlation can take place in one of two ways: through filtering, which eliminates event data that's downstream from the root problem; or through true correlation, in which data from several different applications is intelligently reviewed and processed to determine the interrelationship between separate network events.

Although event correlation is still a fairly new idea, a number of related products have been on the market for several years. Seagate, for example, offers a pack-

The oldest and best-known Unix-based enterprise manager on the market today is Hewlett-Packard's OpenView, which was introduced in 1990. OpenView uses the industry-standard SNMP protocol to gather data from multiple network elements via many different network management applications that run on a common workstation.

In 1993, HP began working on a new version of OpenView that was designed to manage very large networks through the distributed interconnection of multiple OpenView servers. This new version, code-named Tornado, was HP's answer to OpenView's limitations. At that time, the software could manage a maximum of only about 1000 nodes.

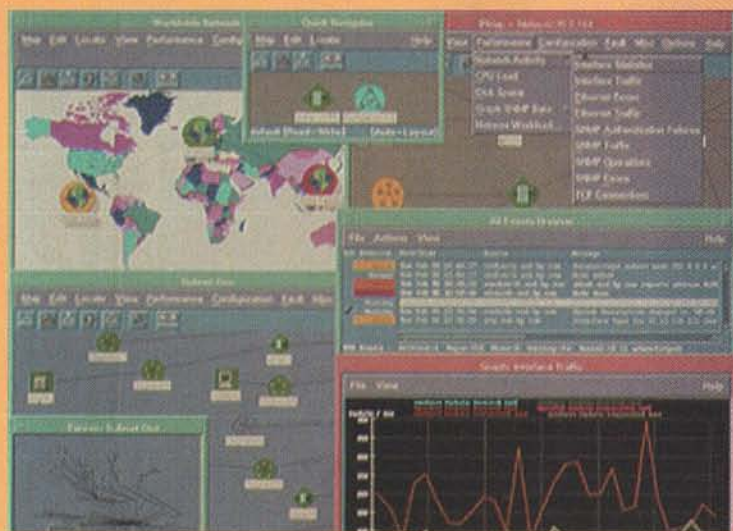
Development problems caused the delivery of Tornado to be delayed more than a year, but last year HP shipped an initial release that expanded the system's ability to process management data as well as increase the number of operators that could work from one OpenView server. However, Tornado 1

didn't provide the distributed capabilities required in the largest corporate networks.

In March, HP unveiled the Tornado 2 release of OpenView, which offers much-expanded distributed management capabilities. Tornado 2, officially designated HP OpenView Network Node Manager 4.1, lets managers use multiple Unix workstations to gather information about networks of 10,000 nodes or more. In the fall, HP will deliver the same software on a Windows NT platform.

The new release of OpenView also includes a new management tool, called OpenView Workgroup Node Manager, which is designed to manage smaller workgroups or departmental networks. The workgroup management tool, which also runs on Unix or NT, can interface with Network Node Manager 4.1, enabling users to handle some management tasks locally without giving up the ability to pass some management information to an enterprise management platform in the central network-control center.

Tornado Touches Down



HP OpenView Network Node Manager 4.1 lets multiple Unix and Windows NT workstations monitor networks with thousands of nodes.

age called NerveCenter that correlates SNMP events; other suppliers, such as Boole & Babbage, Maxm, and Objective Systems Integrators, sell products that focus on the correlation of events in non-SNMP legacy environments as well.

Sometimes the lack of data integration between management applications creates difficulties in pinpointing the origin of a network problem. For instance, the router might indicate that a problem is caused by an overflow of data from a particular server; meanwhile, the server may

indicate that the problem is in the router. This situation, sometimes called *finger-pointing*, is a common complaint of enterprise management platform users.

Many enterprise management platform vendors hope to solve the finger-pointing problem by rebuilding their network management applications using object-oriented technology. This capability, which is already in development at companies such as Groupe Bull and IBM/Tivoli, will let users share data across multiple applications, in much the same way

Call Global. Pay Local.

International Calling from 10¢ a minute.*

(and save up to 95% to any country in the world)

Cellular quality · No setup charges

The first service which allows you to call
any phone in the world from your PC

FREE software from our website

FREE trial to any toll-free 800 or 888#

RATES FROM ANYWHERE TO

JAPAN	\$0.40
GERMANY	\$0.36
SINGAPORE	\$0.36
FRANCE	\$0.35
AUSTRALIA	\$0.28
SWEDEN	\$0.22
UNITED KINGDOM	\$0.18

Visit our website for complete details and free software:

<http://www.net2phone.com>

Call us toll-free using Net2Phone
at 1-800-438-8879

NET2PHONE™

Or call direct at 201-928-2990.
E-mail us at: info@net2phone.com

Putting global calling within everyone's reach.

BY1096

Net2Phone requires caller only to have multimedia PC with any PPP Internet connection. Receiving party gets call on regular phone. *Rates to the US. 15¢ peak, 10¢ off peak. NET2PHONE IS A TRADEMARK OF IDT CORPORATION

TOTAL INTERNET

\$15.95*

MONTHLY



IDT Internet

TO SIGN UP/GET INFORMATION CALL ANYTIME:

1-800-689-9438

The lowest flat monthly national Internet rate

Macintosh™ and
Windows™ 3.x/95 compatibility

No per minute charges

Unlimited tech support 24 hours a day

Internet access available in most U.S. cities

UNLIMITED! UNCENSORED!



http://www.idt.net/ 6126				
SAVE UP TO 99% MONTHLY WITH IDT				
Monthly Usage	CompuServe™	AOL™	AT&T™	IDT
1.5 Hours per day	\$73.70	\$93.70	\$19.95	\$15.95
3 Hours per day	\$161.45	\$226.45	\$19.95	\$15.95
All day	\$1,389.95	\$2,084.95	\$19.95**	\$15.95*

For Web Page Design
and Domain Designation call (201) 928-1000 x4640
For 56K or T1 please call (800) 573-9438

that users of the Microsoft Office suite can share information across Word, Excel, and PowerPoint via OLE.

User Approaches

Besides dealing with the deficiencies of technology and tools, corporate network managers must also face the grim reality that no two organizations, or their networks, are alike. Therefore, the method of implementing enterprise network management platforms might differ significantly from company to company.

Some firms, particularly long-established IBM mainframe shops, have a central data center that controls most of the data network management functions in the enterprise. These organizations prefer a central point of control for monitoring all network activity, such as what the mainframe-based NetView provided in past years. This allows all troubleshooting, as well as other administrative tasks, to be handled by a centralized group of people and software.

In today's client/server multivendor environment, this centralized method of control can even be applied to the use of SNMP-based enterprise management systems. The network manager might divide the enterprise into multiple management domains—based on geography, applications, or traffic type—each managed by local SNMP platforms. These local platforms would all be connected to a single, central platform that collects filtered data to create a high-level view of the entire enterprise.

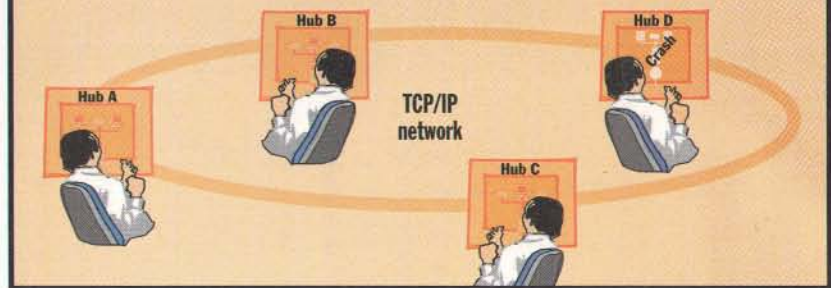
However, the proliferation of client/server technology, as well as the decentralization of many large businesses, is making centralized management increasingly difficult. In many large enterprises, network management and administration decisions are made at a departmental or business-unit level. The central MIS manager is responsible for coordinating these distributed activities—as well as distributed multivendor tools and personnel—across the enterprise.

Unfortunately, there are no universal truths as to whether centralized or distributed approaches work best in the very largest networks. The decision to use centralized or distributed network management is much like the decision between centralized and distributed personnel management; how you do it depends largely on how the organization operates.

SNMP-based enterprise management

Distributed SNMP Management

By interconnecting all the SNMP "servers," network administrators manage pieces of a large enterprise. This approach expands the scalability of management systems and decreases reliance on a central workstation.



platforms were designed to function in distributed environments, collecting data in many different formats across many different domains (see the figure above). But, as previously mentioned, the lack of server-to-server communications capability in many SNMP platforms has made this approach hard to implement, since this capability is a prerequisite for scalability in very large network environments.

Whether centralized or distributed, it seems that today's enterprise management platforms have barely scratched the surface of the data they will eventually have to manage. In large organizations, the network management system is rapidly becoming the point at which the pulse is taken for the entire IS environment.

For example, many enterprise management platform vendors are adding systems management capabilities to their network management platforms. These capabilities let an administrator monitor hardware parameters, such as I/O performance, response times, and storage utilization, as well as the performance of the network. In fact, some products, such as HP's IT/OperationsCenter and IBM's SystemView, actually subordinate the network management function to a higher-level system management function.

Large organizations have recently taken this evolution a step further by focusing on enterprise applications management. Administrators employ systems and network management tools only to support the end game of ensuring that specific mission-critical applications are available and are performing well. This approach makes sense to CEOs and end users, who seldom have a great deal of knowledge of network or systems management but know when their applica-

tions are not performing as they should.

The addition of systems and applications management functions threatens to completely overwhelm today's enterprise management platforms, which have already proven to be deficient in handling network-specific data alone. How will these platforms be able to keep up?

One development that will help is the recent improvement in SNMP platform scalability. Several of the industry's leading platforms, including HP's OpenView and Cabletron's Spectrum, are now delivering server-to-server distribution capabilities that should enable them to scale to infinitely large networks. The ability of these systems to handle network and systems information—even in environments of 10,000 nodes or more—is improving significantly.

Object-oriented technology may make it easier for applications running on the same platform to share data. Companies such as IBM/Tivoli are advancing new object-oriented frameworks for building management tools; this should result in improved integration. Vendors are also integrating event correlation, rules-based reasoning, and even AI into network management systems to reduce reliance on human operation and make network administrators more productive.

Will tomorrow's enterprise management systems replace the human network administrator? Not in our lifetimes. But with new technology, administrators may be treated to a little more boredom and a lot less terror. **B**

Tim Wilson is a senior consultant at Decisys, Inc., an enterprise network consulting firm based in Sterling, Virginia. You can reach him at twilson@decisys.com.

First Desktop RAID for SPARC™

RD10

RAID Storage Subsystem

Features

- High Availability
- True RAID data integrity
- Fast throughput-17mb/sec
- Up to 25.2GB storage
- SPARC/SUN pizza box form factor
- Easy to use GUI

When you need your data safe, reliable, and ready, the Integrax RD10 delivers high performance with low cost per Mbyte.

Thanks to a dedicated 33MHz RISC processor and enhanced RAID technology, combined with dedicated I/O processors for each drive and host, the RD10 reaches throughput speeds in excess of 17Mbytes/sec. For high availability environments, dual fast/wide SCSI ports make your data available to two hosts simultaneously.

Five different hardware RAID levels, hot spare disks, and hot-swappable drives keep your data safe and secure. Data automatically and transparently rebuilds on the spare drive eliminating downtime and data loss. Data integrity is assured for all mission-critical applications.

The RD10 Graphical User Interface eliminates the need to type obscure commands found buried in the back of a service manual. Historical performance software analyzes and fine tunes your RAID. Configuration and firmware upgrades can be handled automatically. RD10 status and context-sensitive online help are made instantly available. All with the click of a mouse button.

RD10 RAID Storage Subsystem

Compatible with Solaris and Windows NT

RD10 RAID Throughput Performance

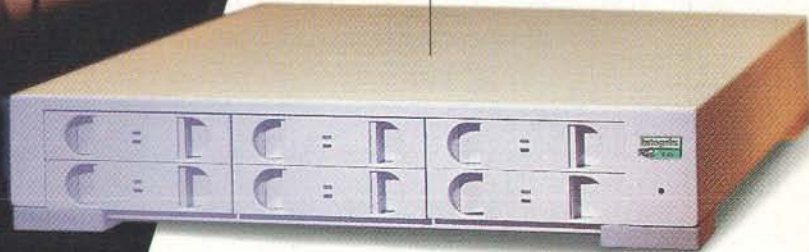
(5400rpm F/W SCSI-2 HDD)	Mbytes/sec	IOs/sec
Sequential Read (max)	16.8	1307
Sequential Write (max)	17.2	1247
Random Read (max)	9.9	620
Random Write (max)	13.0	357

RD10 RAID Subsystem Specifications

RAID Levels Supported	0, 1, 3, 5, 6, (0+1)
Processor	33MHz 32bit RISC
Cache Memory	8Mbytes to 128Mbytes
Channels	2 host channels 6 disk channels
Disks Supported	3.5", 1" high SCA-2 or 68-pin connector Fast/wide Single Ended SCSI-2 interface

See Us at UNIX Expo, Booth 1276

www.integrax.com



Corporate Headquarters

2001 Corporate Center Drive
Newbury Park, California 91320
Tel: 800-300-8288 / 805-376-1000
Fax: 805-376-1001
Email: sales@integrax.com
<http://www.integrax.com>

Asia

Beijing, P.R.China
Tel: 8610-253-5305
Fax: 8610-253-5306
Seoul, Korea
Tel: 822-515-5303
Fax: 822-515-5302

19 Pentium Portables Do Multimedia

With Pentium processors, gigabytes of drive space, large screens, and CD-ROM drives, these notebooks are more than ready for prime time.

By Maggi Bender, Jim Kane, and John McDonough

When it comes to work, today's multimedia notebooks certainly let you take it with you. Running Pentium processors at rates of up to 166 MHz, today's multimedia notebooks might not be as fast as the top Pentium and Pentium Pro desktop systems, but they make good business computers, both on the road and in the office. These high-end Pentium notebooks are also expensive, being almost twice the cost of comparably configured desktop systems. However, with accelerated graphics, large active-matrix color displays, CD-ROM drives, and 810-MB or larger hard drives, they provide full-throttle computing for on-the-go professionals.

We tested 18 Pentium portables that range in price from \$3000 to almost \$7000 and employ 100-, 133-, or 166-MHz CPUs. We also included Canon's AMD 5x86-powered Innova Book 360CD (see the text box "AMD Inside" on page 123), which provides Pentium performance. You can buy a more economical 486DX4-based notebook, but you'll want a Pentium to handle graphics-intensive multimedia tasks under Windows 95 or OS/2 Warp—and to delay your next upgrade cycle.

Modular components have become a hot notebook feature. Many high-end notebooks we test here provide an all-purpose bay that can hold a CD-ROM player, a floppy drive, or an additional battery. You swap them in and out depending on what you need. You can't use floppy and CD-ROM drives simultaneously, but the modular design saves space, weight, and battery power while maintaining desktop functionality. We

included two ultrathin systems—Digital Equipment's HiNote Ultra II and the Impulse Duonote—because they have attachable multimedia bases for CD-ROM and stereo-sound functionality, another form of modularity.

Most of the portables we tested have removable hard drives, a feature that ensures upgradability. Even the 2.1-GB hard drive in Micro-International's Mint 5200 may seem small in a year or two. Most notebooks have two Type II PC Card slots and infrared ports for cable-

BYTE BEST

PENTIUM PORTABLES

NEC Versa 6030H

offers chart-topping performance,
numerous portability features,
and excellent ease of use.

less file transfers. The Toshiba and NEC units implement the new 4-Mbps IrDA 1.1 infrared standard.

All test notebooks came with active-matrix screens that display graphics with crisp details and deeply saturated colors. With three 10.4-inch exceptions, the high-end notebooks we reviewed have either 11.3- or 12.1-inch SVGA displays. All can display at 800- by 600-pixel resolution, which is great for Windows 95, but you'll want a big display and one with a wide horizontal viewing angle if you routinely use your notebook with a handful of people sitting around a table. The 12.1-inch panels provide roughly the same viewable screen real estate as a 14-inch desktop monitor.

Less expensive passive-matrix displays are still an option with most of these products, but the trend is toward the bigger, brighter, more responsive active-matrix displays. IBM, for instance, dropped its ThinkPad 550 with the pop-open butterfly keyboard so it could add more screen real estate, and Toshiba's cutting-edge Tecra 730CDT supports an unusual 1024- by 768-pixel resolution on its 12.1-inch screen (we reviewed the Tecra 500CDT).

Those notebooks costing more than \$5000 are from big-name vendors such as Compaq, Gateway 2000, IBM, and NEC Technologies. Compared to less expensive units, they come with more software and longer warranties. A unit such as IBM's ThinkPad 760ED, for instance, has multimedia luxuries: a 64-bit graphics chip with 2 MB of dual-ported video memory, hardware-assisted MPEG playback, an internal 28.8-Kbps data/fax/telephony modem, and lithium-ion batteries that outlast nickel-metal-hydride (NiMH) batteries in our battery run-down tests.

Such feature-laden portables use battery power quickly. We suggest that you get a notebook that can hold multiple lithium-ion batteries if you want to work throughout a cross-country plane flight.

The two 166-MHz notebooks we tested turned out not to be the fastest. In spite of 256-KB Level 2 caches, the Chem Book 5580 and the Micro-International Mint 5200 didn't perform as well as the 133-MHz NEC Versa 6030H. Typically, a 166-MHz Pentium system should perform 10 percent faster than a 133-MHz system. The Mint 5200 suffered from below-average memory performance and slow hard drive and CD-ROM drive speed. The

CD UNIT

The four- and even six-speed modular CD-ROM drives that can fit in a notebook are a must for multimedia applications and installing large application or development packages. While some notebooks have external CD-ROM drives, most have a modular CD-ROM drive that you swap with the floppy drive.

STEREO SPEAKERS

Though they typically don't provide the greatest sound quality, a pair of integrated stereo speakers and 16-bit Sound Blaster Pro sound are good enough for most multimedia presentations, games, and telephony.

LCDs

Multimedia notebooks with 11.3- or 12.1-inch active-matrix color displays provide crisp viewing at 800- by 600-pixel resolution. Lots of video memory and a hardware MPEG decoder help some systems display TV-quality, screen-filling video.

INTERNAL BATTERY

Most notebook vendors have made the transition from nickel-metal-hydride (NiMH) batteries to lithium-ion battery packs. Although they're costlier, lithium-ion batteries lasted longer in our battery run-down tests. They also provide more charging cycles than NiMH batteries.

HARD DRIVE

Some 7-pound computers now support a fast 2-GB internal hard drive (19-mm height). Even better, most notebooks have removable drives for upgrading or securing your data at night.

POINTING DEVICE

Everybody has a preference when it comes to pointing devices. Judging from the units we tested, touchpads and eraser-like pointing sticks are in, while trackballs are out.

IrDA INTERFACE

Infrared technology lets you transfer files to another system or send print commands without cables to IrDA-equipped printers. Most notebooks transmit at 115.2 Kbps. Toshiba's Tecra 500CDT supports the new 4-Mbps Fast-IR IrDA 1.1 specification, as does the NEC Versa 6030H.

Rear View



Chem Book 5580 was hurt by poor memory and hard drive performance.

For multimedia, software development, or just to load large applications, a notebook must have a built-in CD-ROM drive. We recommend that you get one with a four- or six-speed CD-ROM drive for faster read and seek times. Multimedia notebooks must also have integrated stereo speakers, though a small speaker size limits sound quality.

Notebooks that come with hardware-assisted MPEG—the Compaq LTE 5300, NEC Versa 6030H, Nimantics Quanta 6x 133, Impulse Duonote, and IBM ThinkPad

760ED—can effectively zoom video clips to full-screen without the dropped frames and blocky pixellation associated with software-only MPEG. Having 1 or 2 MB of dedicated video memory and a PCI-bus architecture also helps to enhance graphics I/O performance.

Toshiba's Tecra 500CDT has a Zoomed Port Video (ZPV) PC Card slot. The proposed ZPV standard establishes direct communication between the PC Card controller and the audio and video controllers, so that large amounts of multimedia data don't require processing through the CPU or system bus. When ZPV cards be-

come widely available, the Tecra 500CDT will provide a fast connection for full-motion video playback. The Tecra 500CDT and NEC's Versa 6030H also support Card-Bus, another proposed standard. This standard provides for 32-bit PC Card peripherals such as Fast Ethernet and Fast SCSI adapters.

Contributors

Jim Kane, Project Manager/NSTL
John McDonough, Technical Writer/NSTL
Maggi Bender, Senior Tester/NSTL
Dave Rowell, Senior Technical Editor/BYTE

Best Overall

P E N T I U M P O R T A B L E S

Almost every desktop maker now has a portable for sale, and the market is stratifying with notebooks at different price/performance levels. Higher-priced Pentium notebooks are heavy on cutting-edge components, while value systems are capable but lack such advanced features as hardware-assisted MPEG playback. For this reason, we rated the notebooks in three categories: best-overall portable, best desktop replacement, and best low-cost notebook (under \$4000).

Best Overall

We chose the well-rounded NEC Versa 6030H as the best-overall notebook. It has fast performance, a multitude of portability features, and a high ease-of-use rating. While the Versa 6030H is a hot multimedia notebook, several other models weren't far behind in our best-overall ranking.

Shadowing the Versa 6030H was the WinBook FX (our pick for best low-cost system; see below). Toshiba's 8.2-pound Tecra 500CDT also did well. The \$4999 unit provides many leading-edge fea-

tures, including Zoomed Port Video (ZPV) and CardBus support, as well as 4-Mbps IrDA capability. With a 120-MHz Pentium, it performed better than many units with 133-MHz processors, and it placed in the top five for battery life.

Impulse Computer may not be familiar to many users, but its Duonote made a big splash in our Lab Report. It's a moderately priced multimedia notebook (\$4699) with a nice modular design. Compaq's \$6398 LTE 5300 is a 7.4-pound lightweight that also placed in the top five. The highly modular system scores high in features (right behind the IBM ThinkPad 760ED and Hewlett-Packard's OmniBook 5500 CTS) and also in usability, because Compaq supplies a three-year warranty and 24-hour, toll-free technical support. (An even more modular model that wasn't ready in time for this roundup, the Compaq Armada 4100, is reviewed in "Notebook Under Construction" on page 154.)

Best Desktop Replacement

Several notebooks in this roundup beg the question: "Do I really need that desk-

stealing power hog back in my cubicle?" Not only do these systems provide excellent docking options, the best desktop-replacement systems run fast and furious in our performance benchmarks, providing desktop-level performance. NEC's Versa 6030H, our best-overall pick, is again the winner, but some strong runners-up are Toshiba's Tecra 550CDT and Compaq's LTE 5300.

The 7.5-pound Nimantics Quanta 6x 133 is an affordably priced (\$3999) multimedia notebook with high-end functionality. It has a 12.1-inch SVGA display, a voluminous 2.1-GB hard drive, and an efficient lithium-ion battery that lasts 2 hours and 37 minutes in our tests.

HP's OmniBook 5500 CTS (\$6120) costs much more than the Quanta 6x 133, but it's a premium notebook for making presentations with its wide-angle 12.1-inch SVGA display.

Best Low Cost

It's quite a stretch to call any multimedia notebook a low-cost product, but some are easier on the credit card than others. We drew a low-budget line in the sand at \$4000, which left us with nine notebooks. The WinBook FX is our low-cost winner. It had high all-around scores and did particularly well in usability. Nimantics' Quanta 6x 133 took the number-two spot, followed closely by Texas Instruments' 100-MHz Extensa 570 CDT.

Dell's Latitude LM P-133ST had the best battery life of all the test units. Its lithium-ion battery and effective power management scheme kept it going for 3 hours and 41 minutes in our battery run-down test. We must also give battery-life honorable mentions to the Gateway Solo S5-133 (3:31) and IBM's ThinkPad 760ED (3:24), which both also use lithium-ion batteries (but aren't low-cost portables).

The 6.1-pound TravelPro 1900 (\$3695), from AMS Tech, is a top-quality multimedia portable with a 133-MHz Pentium, a 12.1-inch SVGA display, a 1.3-GB hard drive, and a three-year warranty—components and support you would expect from a higher-priced notebook.

TECH FOCUS HEAT CONTROL

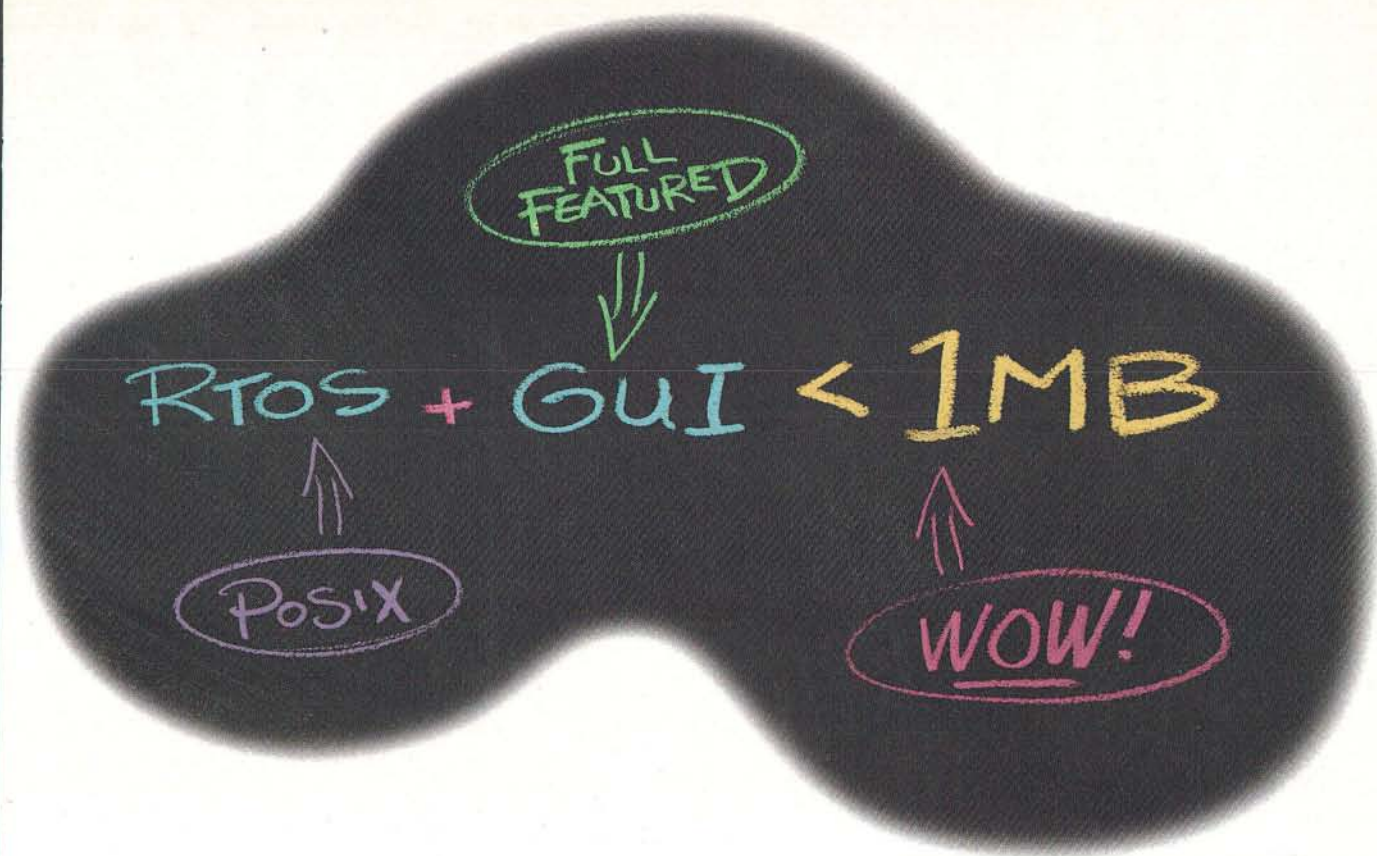
Taking the Heat

Heat is the limiting factor in getting high-end desktop performance out of a portable computer. The more heat a notebook design can dissipate, the faster you can reliably run the CPU or the more memory you can hold. Fan-induced convection cools most desktop systems, but fans are unacceptable in notebooks—they're noisy, power-consuming, and a potential failure point. Convection also needs space for air to move, something compact notebook designs lack.

Good notebook designs rely instead on passive conduction. Heat is conducted away from the CPU, hard drive, and the graphics subsystem to exterior surfaces capable of radiating heat. The keyboard, the I/O port area, and (if it's not a docking unit) the bottom surface of the notebook (that isn't blocked by the battery) are all good surfaces for dissipating heat.

An aluminum heat sink will quickly draw heat away from the CPU, but the heat must then be conducted to the outside. Typically, metal sheets or frame elements, often made of a lightweight, conductive magnesium alloy, serve this purpose. Compaq's Armada 4100 series, for example, has a magnesium chassis that provides structural stiffness to the notebook, a path for outward heat conduction, and external radiation surfaces. Tadpole's notebooks can handle the latest desktop processors because they have a magnesium-alloy case that is thermally connected to the CPU.

Some designs use heat pipes to beef up thermal conduction by metal plates. These small-diameter sealed metal tubes contain a liquid that wicks from one end of the tube to the other, driven by a thermally induced fluid-to-vapor cycle. The pipe serves as a passive but effective heat pump.



Do more with less.

Most operating systems leave little room for important things. Like your application.

With the QNX realtime OS you'll pack more functionality into less memory. Achieve more performance with less-expensive CPUs. And deliver better solutions at a lower price.

Better yet, QNX supports more PC hardware than any other realtime OS. Whether it's PC/104 or PCMCIA, embedded X86 or the Pentium® Pro, QNX lets you use it right out of the box. Get to run time in less time!

More scalable than ever! From low-end to high-end, QNX offers you the ultimate in scalability. Even your deeply embedded systems can boast a scalable POSIX RTOS, thanks to our new, exceptionally small Neutrino™ microkernel.

And if you need to add the capabilities of a high-end GUI to your low-end system, you can. Our award-winning Photon microGUI™ gives you a phenomenal front end, with enough memory left over for important things . . . like your application!

www.qnx.com

Call **1 800 676-0566 (ext. 1027)**
or email **info@qnx.com**



The Leading Realtime OS for PCs

QNX Software Systems Ltd., 175 Terence Matthews Crescent, Kanata, Ontario, Canada K2M 1W8 Voice: 613 591-0931 Fax: 613 591-3579
Europe: 49 Dove Park, Chorleywood, Hertfordshire. Voice: (44)(0)1923 284800 Fax: (44)(0)1923 285868 Email: QNXeurope@qnx.com
© QNX Software Systems Ltd. 1996. QNX is a registered trademark and Neutrino and Photon microGUI are trademarks of QNX Software Systems Ltd. All other trademarks belong to their respective owners.

What is nStor?

CR2

LOW COST,
MIRRORING/DUPLEXING

CR6e

HIGH
PERFORMANCE
WORKSTATIONS/
SMALL TO MEDIUM
SERVERS

CR8

LARGE SERVERS,
RACK CONFIGURATIONS

Manageable Fault-Tolerant Storage

Lasting quality and reliability are built into every nStor RAID system. From the easy-to-use Alert Manager software to the redundant hot swap components, data integrity is our first priority. nStor systems are the first to incorporate the SAF-TE (SCSI Accessed Fault-Tolerant Enclosures) standard which is leading-edge technology to protect your investment. In addition, nStor utilities provide unmatched manageability which allows

you to switch RAID levels or capacity on-the-fly. You can also configure a hot spare for automatic data reconstruction without user intervention. So whether you're looking

RELIABILITY MANAGEABILITY

	RAID MODEL	NETWORK, WINDOWS NT, OS/2, SCO COMPATIBILITY	MAX CAPACITY	RAID LEVELS	DRIVES	POWER SUPPLIES	FANS	SAF-TE	ALERT MANAGER
CR2	•	18GB	Q1,3,5	•	•				
CR6e	•	24GB	Q1,3,5	•	•	•	•	•	
CR8	•	72GB	Q1,3,5	•	•	•	•	•	

ing for manageability or reliability nStor RAID systems meet

your needs. nStor systems support RAID levels 0, 1, 3, 5 and are compatible with FAST

WIDE SCSI. Call for more information or visit us on the web at <http://www.nstor.com/>



nStor. Formerly Conner Storage Systems

1.800.RAID511 ▼ 407.829.3500 ▼ Europe: +44(0)1234 213571

©1996, nStor Corporation, Inc. All trademarks are of their respective owners. Specifications subject to change without notice.

LAB RESULTS

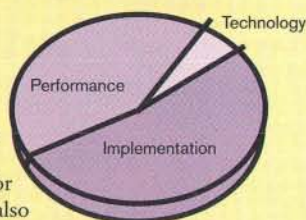
P E N T I U M P O R T A B L E S R A T I N G S

BEST OVERALL

NEC Technologies Versa 6030H

The Versa 6030H (\$5799) is our best-overall portable Pentium because it is fast, feature-packed, and easy to use. The 9.5-pound unit races through our benchmarks with a 133-MHz Pentium processor, 256 KB of synchronous pipeline cache memory, a PCI bus, and 2 MB of video memory. The Versa 6030H is a strong multimedia machine with hardware-accelerated MPEG for full-motion, full-screen video playback; a six-speed CD-ROM drive for fast data transfers; and excellent 16-bit stereo sound. The system also has a healthy bundle of applications and telephony features for those who need to keep in touch with the office.

WEIGHTING



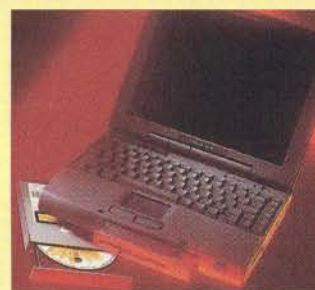
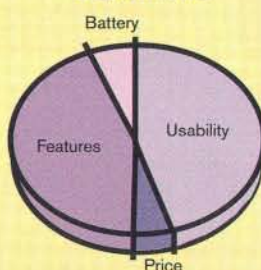
	PRICE	TECHNOLOGY	IMPLEMENTATION	PERFORMANCE	FEATURES	USABILITY	BATTERY	OVERALL RATING
NEC Versa 6030H	\$5799	★★★★	★★★★	★★★★★	★★★★	★★★★★	★★★	★★★★
WinBook FX	\$3999	★★★★	★★★★	★★★★	★★★★	★★★★★	★★★★	★★★★
Toshiba Tecra 500CDT	\$4999	★★★★	★★★★	★★★★	★★★★	★★★★★	★★★★★	★★★★
Impulse Duonote	\$4699	★★★★	★★★★	★★★★	★★★★	★★★★	★★★	★★★★
Compaq LTE 5300	\$6398	★★★★	★★★★	★★★★	★★★★	★★★★	★★	★★★★

BEST DESKTOP REPLACEMENT

NEC Technologies Versa 6030H

With its strong performance score, the Versa 6030H is also our choice for best desktop replacement. It is not only efficient but flexible with its easily accessible Versabay II, which supports a floppy drive, an extra hard drive, an extra battery, or the CD-ROM drive. For an extra \$799, NEC offers even more desktop functionality with its Docking Station 6000, which has three expansion-card slots, three drive bays, built-in speakers, four audio ports, and an RJ-11 phone jack.

WEIGHTING



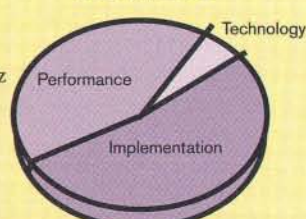
	PRICE	TECHNOLOGY	IMPLEMENTATION	PERFORMANCE	FEATURES	USABILITY	BATTERY	OVERALL RATING
NEC Versa 6030H	\$5799	★★★★	★★★★	★★★★★	★★★★	★★★★★	★★★	★★★★
Toshiba Tecra 500CDT	\$4999	★★★★	★★★★	★★★★	★★★★	★★★★★	★★★★	★★★★
Compaq LTE 5300	\$6398	★★★★	★★★★	★★★★	★★★★	★★★★	★★	★★★★
Nimantics Quanta 6x 133	\$3999	★★★★	★★★	★★★★	★★★★	★★★★	★★★	★★★★
HP OmniBook 5500 CTS	\$6120	★★★★	★★★★	★★★	★★★★★	★★★★	★★	★★★★

LOW COST

WinBook FX

You don't have to pay \$6000 for a multimedia notebook. The WinBook FX goes for \$3999 and sacrifices little. With a 133-MHz Pentium, 16 MB of RAM, and 1 MB of video memory, the WinBook FX does admirably in our performance benchmarks. The 6.8-pound laptop has an 11.3-inch SVGA display, Sound Blaster Pro-compatible sound, a 1.3-GB hard drive, and a lithium-ion battery that lasts 2 hours and 38 minutes in our Thumper II run-down test.

WEIGHTING



Sub-\$4000 notebooks only

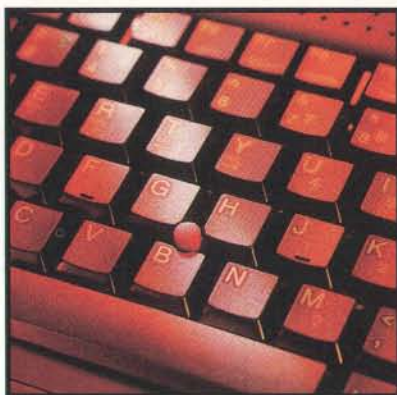
	PRICE	TECHNOLOGY	IMPLEMENTATION	PERFORMANCE	FEATURES	USABILITY	BATTERY	OVERALL RATING
WinBook FX	\$3999	★★★★	★★★★	★★★★	★★★★	★★★★★	★★★	★★★★
Nimantics Quanta 6x 133	\$3999	★★★★	★★★	★★★★	★★★★	★★★★	★★★	★★★★
TI Extensa 570 CDT	\$2999	★★★★	★★★★	★★★	★★★★	★★★★	★★	★★★★
Dell Latitude LMP-133ST	\$2999	★★★★	★★★★	★★	★★★★	★★★★	★★★★★	★★★★
AMS Tech TravelPro 1900	\$3695	★★★★	★★★★	★★★	★★★★	★★★★	★★★	★★★★

★★★★★ Outstanding ★★★★ Very Good ★★★ Good ★★ Fair ★ Poor

Details

Ultracool Design

If you find most notebook designs boringly similar, check out Digital Equipment's HiNote Ultra II. Its sleek, angled chassis should turn the head of any individualist. The HiNote Ultra II has a lithium-ion battery that clips onto the rear and two attachable base modules: One is a thin wedge with a floppy drive, while the larger multimedia base provides speakers and a CD-ROM drive. Do you think Compaq found inspiration here for its new Armada 4100?



Making Your Point

Users can often choose from many different peripherals when buying a notebook, but the pointing device usually isn't one of them. The WinBook FX comes standard with a pointing stick between the G, H, and B keys. For an extra \$80, however, you can opt for a dual-button touchpad.

NEC's Bug Barrier

NEC's Versa 6030H has two hot-loaded McAfee antivirus software packages—VirusScan and WebScan—that guard the system from known viruses and provide virus protection for the most popular Internet services, Web browsers, and e-mail.



Up Against the Wall

Hooking a 17-inch monitor to a notebook is a cost-effective way to make a presentation to a small group of people sitting around a table. For larger groups, however, you need projection. You can buy an LCD panel that sits on an overhead projector or a self-contained projection unit. In either case, your notebook drives the display. Wedge Technology's ShowBiz 5000P (\$4799) provides another option.

The ShowBiz 5000P is a Pentium notebook with an LCD that converts into an overhead projection panel. Like a few projection notebooks before it (see "Presentation Quality," September 1995 BYTE), the ShowBiz 5000P lets you make large-room presentations at any office with an overhead projector. While the ShowBiz 5000P is best for software demonstrations, Wedge also offers optional MPEG playback and TV cards, so you can project videos 6 feet high on a screen.

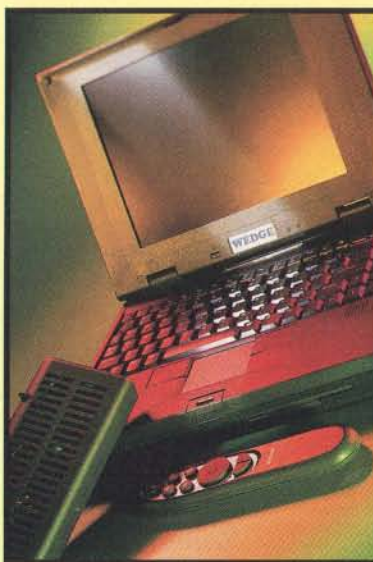
We found the LCD projection panel easy to set up. After removing a protective back panel from behind the ShowBiz 5000P's 10.4-inch active-matrix display, you place the LCD panel on an overhead projector. A support tray for the notebook itself attaches to the projector. The display supports 800- by 600-pixel resolutions at 65,536 colors. The unit comes with a cooling fan that connects to the LCD panel to dissipate the heat from the projector's lamp.

Though the projected images are not as bright as on some desktop projectors (see "Road-Show Romance" on page 55), we found the images to be clear and well defined when shown in a fairly dark room. It takes some adjustment of the LCD projection panel to eliminate ambient light from the overhead projector, but that should not

be a problem after you get used to setting it up.

The notebook sits directly in the path of the overhead projector, so Wedge supplies an infrared-attached remote-control device so the presenter can control the PC. Mind Path's Presentation F/X software lets you move the mouse around the display and zoom in on different areas of the screen.

—John McDonough



ShowBiz 5000P

\$4799 (fully loaded system)

Wedge Technology, Inc.
Milpitas, CA

(408) 263-9888

<http://www.wedgetech.com>

Circle 1080
on Inquiry Card.

RUGGED PORTABLES WITH LOTS OF SLOTS

Dolch Computer Systems builds portable computers for industrial and military applications that must withstand the rigors of rough treatment and harsh environments — demanding massive expansion capability and the performance of a high-end desktop.

GRIT, GRIME AND WATER PROOF

Dolch builds the world's toughest portables for sophisticated military and industrial users.

- ☐ Tested to Military and NEMA Standards — Shock to 50Gs
- ☐ Completely Sealed Systems — NotePAC™ Runs in the Rain
- ☐ Add-in Protection — Unique Card Retention System

MASSIVE EXPANSION

The PAC™, L-PAC™ (Light-PAC) and NotePAC families offer a wide variety of slot and drive specifications. Systems can be tailored to precisely match the application requirements.



- ☐ From 1 to 7 Expansion Slots — ISA, EISA, PCI and PCMCIA
- ☐ Up to 4 Drive Bays — Tape, CD-ROM, Removable, etc.
- ☐ Configurable System Power — 100 watts to 350 watts

UNRIVALED PERFORMANCE

Dolch PAC portables are available with a broad range of performance options — meeting or exceeding all the best of desktops.

- ☐ CPU Options — 486 up to Dual Pentium at 150MHz
- ☐ Displays — 16.7 Million Colors or Daylight Readable Mono
- ☐ Active Matrix TFT Screens — Up to 12.1-inches
- ☐ Resolution — 640 x 480, 800 x 600 and 1024 x 768
- ☐ Graphics Performance — In Excess of 115 WinMarks™
- ☐ Drives — EIDE or High-speed PCI SCSI — Up to 9 GB
- ☐ Memory — High Speed Cache and EDO DRAM

Dolch Computer Systems
3178 Laurelview Ct.
Fremont, CA 94538 USA

Tel. 510.661.2220 ; Fax 510.490.2360

Web Site — <http://www.dolch.com>

CALL TODAY: 1.800.995.7580.

Dolch.



If you think file transfer is all we do, you need some time away from the office.



To appreciate how much more LapLink® for Windows® 95 has to offer, all you have to do is hit the road.

Wherever you go—across the hall, across town or across the country—if you've got LapLink, you have everything you need to access anything you want on your desktop or your network.

With this single piece of software, you can read and send e-mail, run databases and custom applications, synchronize data and, yes, even transfer files.

Since there's no need to change apps to do all these things, there's no need to hang up and redial. And since LapLink works the same

way over modems, IPX and TCP/IP networks, serial cables, parallel cables, wireless, even the Internet, there's no need to laboriously reconfigure.

And there's no need to worry about compatibility. Our 16-bit version is built right into LapLink for Windows 95, so connecting to Windows 3.1 systems is no problem at all.

By now, you probably can't wait to get your hands on the latest LapLink. So you'll be glad to know that upgrading—from an earlier LapLink, or from another product altogether—is ridiculously inexpensive. Call 800-224-7704. Better yet, see your reseller. It'll give you an excuse to get away from the office.

TRAVELING
SOFTWARE



Test Specs

We picked the best portable Pentiums by running low-level and application benchmarks under Windows 95, as well as battery tests under real-world conditions. We also weighted important notebook features and how easy a system is to set up and use.

Performance

For the Windows 95 application benchmarks, we ran scripts with 32-bit versions of Microsoft Word (7.0) and Excel (7.0) plus a 16-bit version of FoxPro (2.6). NSTL's low-level InterMark Multimedia PC tests exercise specific components of the notebook: CPU, hard drive, CD-ROM drive, and sound (percentage of CPU utilization). InterMark video benchmarks test how well a system can produce multiple Windows draws, bit-mapped images, and display screens generated by applications like PowerPoint and CorelDraw.

Battery Life

We measured battery life with our Thumper II battery run-down tester. Thumper II emulates a typical word processing session. It uses robotic arms and an optical screen sensor to detect and control each system's power management function. Before testing, we completely drained and recharged each notebook's battery twice, according to the vendors' instructions. People use their notebooks in different ways, so you will probably get different battery life with a given portable.

Features/Usability

We reward features that differentiate the notebooks. For instance, AMS, Compaq, Dell, Digital Equipment, Hewlett-Packard, IBM, Impulse, NEC, and Toshiba back their systems with impressive three-year warranties, as opposed to one-year warranties with the other vendors. We

asked the vendors to fill out a lengthy features questionnaire, and we verified the features in the labs. For usability, technicians worked extensively with each notebook to assess the quality of the keyboard, status indicators, and pointing device. We also evaluated the user's manuals and checked how easy it was to install modular components and upgrade the systems with memory.

Evaluations in this report represent the judgment of BYTE editors, based on tests conducted by NSTL, Inc., as documented in a recent issue of its monthly PC Digest. To purchase a copy of the full report, contact NSTL at 625 Ridge Pike, Conshohocken, PA 19428; (610) 941-9600; fax (610) 941-9950; on the Internet, editors@nstl.com. For a subscription, call (800) 257-9402. BYTE Magazine and NSTL are both operating units of the McGraw-Hill Companies, Inc.

AMD Inside

Not every road warrior can afford to fork over \$3000 or more for a Pentium-powered multimedia notebook. Fortunately, Canon Computer Systems' Innova Book 360CD provides Pentium performance without the Pentium price. It's a full-fledged multimedia notebook with a price of only \$2599, but it uses the Pen-

tium-compatible 133-MHz 5x86 processor from AMD.

The Innova Book 360CD doesn't compare favorably with Pentium systems when tested with NSTL's InterMark test of low-level functions. In particular, it was dead last in memory performance. However, these factors don't appear to matter with Windows application performance. With our application tests, the Canon portable outshone all other test systems.

What's the price trade-off then, if not performance? For one thing, Canon cut costs on components by using a 10.4-inch dual-scan VGA display instead of an active-matrix screen and a nickel-metal-hydride (NiMH) battery instead of a longer-lasting lithium-ion battery. The battery lasted 2 hours and 18 minutes in our battery run-down tests, while lithium-ion-equipped models averaged 2:48.

The 6.7-pound (with battery) Canon notebook is light for a multimedia notebook, and it has a modular design with a four-speed CD-ROM drive on the right side that you can swap with a floppy drive. The laptop has an IrDA infrared port in the back, and a Type III PC Card slot and an external monitor port on the left side. It has a 32-bit VL-Bus architecture and 1 MB of video memory to boost its graphics performance.

The unit is ready to hit the road right out of the box with applications such as Sidekick for Windows 95 and FaxWorks 3.0. It also has on-line user documents for each of the bundled applications, so you don't have to drag manuals with you on business trips. Canon backs the Innova Book 360CD with a one-year warranty for parts and labor.

-Eds.



**Innova Book
360CD
\$2599**

Canon Computer
Systems, Inc.
Costa Mesa, CA

(800) 848-4123

[http://www.ccsi
.canon.com](http://www.ccsi.canon.com)

Circle 1064
on Inquiry Card.

PENTIUM PORTABLES

FEATURES

VENDOR/MODEL NAME	Altura Computer Systems Bolt2-133	AMS Tech TravelPro 1900	Austin Computer Systems Austin Edge CD	Canon Computer Systems, Inc. Innova Book 360CD	Chem USA Corp. Chem Book 5580	Compaq Computer Corp. Compaq LTE 5300	Dell Computer Corp. Latitude LM P-133ST	Digital Equipment Corp. Digital HiNote Ultra II CTS 5120
Base price (MSRP)	\$2995	\$3175	\$3160	\$2599	\$2615	\$5999	\$2999	\$4299
Price as tested (MSRP)	\$3595	\$3695	\$4304	\$2599	\$3575	\$6398	\$2999	\$4299
Overall value	7.46	7.87	7.4	7.74	7.50	8.06	7.88	7.65
Performance score	8.3	7.6	6.6	8.7	7.9	8.2	6.6	7.6
Features score	7.5	8.7	8.2	6.1	7.4	8.7	8.4	7.7
Usability	6.9	8.1	8.1	7.5	7.5	8.8	8.8	8.1
Battery life (hr:min) as tested	1:7	2:3	2:8	2:3	1:9	2:2	3:7	2:7
PROCESSOR								
CPU manufacturer, model, and speed (MHz)	Intel Pentium 133	Intel Pentium 133	Intel Pentium 133	AMD Am5x86 133	Intel Pentium 166	Intel Pentium 133	Intel LM Pentium 133	Intel 5P54CSLM 120
Voltage	3.3	2.9	3.1	3.3	3.3	3.3	3.3	2.9
SYSTEM RAM								
RAM as tested/max. 32-bit RAM (MB)/speed (ns)	8/32/70	8/64/60	8/40/60	8/32/70	16/64/60	16/80/60	8/40/70	8/40/70
Memory architecture	EDO	EDO	EDO	Fast-paged	EDO	Fast-paged	Fast-paged	Paged and interleaved
Max. secondary cache RAM (KB)/speed (ns)	1000/40	256/15	256/15	256/70	256/15	256/12	256/8	256/8
SYSTEM BIOS								
Manufacturer	Award	Phoenix	Phoenix	Phoenix	AMI	SystemSoft	Phoenix	SystemSoft/Digital
VIDEO								
Video-processor chip manufacturer and model	Chips & Technologies 65548	NeoMagic 2070	Cirrus Logic GD7543	Chips & Technologies 65540	Chips & Technologies 65550	Opti Viper	NeoMagic 2070	Chips & Technologies 65546A
Diagonal screen size (inches)	12.1	12.1	11.3	10.4	12.1	12.1	12.1	10.4
Display technology	Active-matrix	Active-matrix	Active-matrix	Dual-scan	Active-matrix	Active-matrix	Active-matrix	Active-matrix
Max. display resolution (pixels)/total colors	800 x 600/65,536	800 x 600/65,536	800 x 600/65,536	800 x 600/256	800 x 600/16,000	800 x 600/65,536	800 x 600/65,536	800 x 600/65,536
Video memory as tested (MB)/bus width (bits)	1/64	1.5/128	2/32	INP/32	2/32	1/32	1/128	1/32
Video memory type	DRAM	VRAM	DRAM	INP	EDO	EDO	DRAM	EDO VRAM
Local-bus video type	PCI	PCI	PCI	VESA VL-Bus	PCI	PCI	PCI	VESA VL-Bus
Max. ext. noninterlaced resolution/ total colors or grays	1280 x 1024/16	1280 x 1024/256	1024 x 768/256	1024 x 768/256	1024 x 768/256	1024 x 768/256	1024 x 768/256	1024 x 768/256
PORTABILITY								
Height x width x depth (inches) x weight (lbs.)	2 x 11.89.1 x 9.5	1.8 x 11.8 x 8.8 x 6.1	2.6 x 11.3 x 8.98 x 6.8	1.9 x 11.5 x 8.9 x 8.4	2.2 x 11.7 x 9.9 x 8.5	2.07 x 12.2 x 9 x 7.4	1.94 x 8.9 x 11.75 x 6.8	1.2 x 8.5 x 11 x 4.2
Battery technology	NIMH	Lithium-ion	Lithium-ion	NIMH	NIMH	NIMH	Lithium-ion	Lithium-ion
Supports multiple battery packs		✓	✓		✓	✓	✓	✓
Supports hot swapping						✓	✓	✓
MASS STORAGE								
Hard drive manufacturer and/or model	Toshiba MK-1301MAV	Toshiba HDMK-2720F	Toshiba MK-2700PC	Toshiba MK-1924FCV	IBM DPRA-21215	Compaq	IBM	IBM DSOA-21080
Hard drive interface type	PCI	PCI	IDE	EIDE	EIDE	IDE	EIDE	EIDE
Hard drive controller cache (KB)	N/A	256	128	128	64	128-KB buffer on drive	N/A	96
Max. hard drive capacity (MB)/access time (ms)	2170/10	2100/12	2000/12	810/13	2000/12	1350/13	810/13	1080/13
Removable hard drive	✓	✓	✓	✓	✓	✓	✓	✓
I/O PORTS (BUILT IN)								
UART type	16550	16550	16550	16550	16550	16550	16550	16550
Centronics parallel-port type	Enhanced, extended, selectable	Enhanced, extended, selectable	Enhanced, extended, selectable	Enhanced, extended, selectable	Enhanced, extended, selectable	Enhanced	Extended, enhanced, selectable	Enhanced, extended, selectable
IrDA-compliant infrared data-exchange port	✓	✓	✓	✓	✓	✓	✓	✓
Pointing device	Touchpad	Touchpad	Touchpad	Touchpad	Touchpad	Pointing stick	Touchpad	Trackball
PC Card slots connected concurrently	2 Type II/1 Type III	2 Type II/1 Type III	1 Type II/1 Type III	2 Type II/1 Type III	1 Type II/1 Type III	2 Type II/1 Type III	2 Type II/1 Type III	2 Type II/1 Type III
SOUND								
Sound chip set	Opti 930	ESS 1688	Creative Labs CT2505 (Vibra 16)	INP	ESS 1688	ESS 1688	ESS 1688	ESS 1688
Built-in microphone	✓	✓	✓		✓	✓	✓	✓
H/W speaker volume control	✓	✓		✓	✓	Optional		✓
MPEG hardware and software	Optional/optional	Included/included	/included	N/A / N/A	N/A / included	Optional/optional	N/A / included	
CD-ROM audio out	✓	✓	✓		✓	✓	✓	✓
POWER SUPPLY								
Supports 220/240 AC voltage	✓	✓	✓	✓	✓	✓	✓	✓
Auto-switching/auto-detecting		✓	✓		✓	✓	✓	✓
Internal AC adapter/battery charger		✓			✓	✓	✓	✓
EXPANSION								
Expansion chassis/price, if optional								
Docking station/price, if optional	✓/\$395	✓/\$250	✓/\$350 or \$800			✓/\$499		
Number of ISA/PCI expansion slots	0/0	0/1	0/0	0/0	0/0	0/0	0/0	0/0
Number of full-height 3 1/2-inch/ half-height 5 1/4-inch drive bays	0/0	1/0	0/0	0/0	1/1	0/0	0/0	0/0
WARRANTY								
Length (years)/coverage	1/PLR	3/PLR	1/PLR	1/PLR	1/PLR	3/PLR	3/PLR	3/PLR
Phone	(719) 685-5502	(818) 814-0782	(512) 339-3500	Call local Canon dealer	(510) 785-8080	Call local Compaq dealer	(512) 338-4400	(303) 872-8933
Toll-free phone	N/A	(800) 886-2671	(800) 752-1577	(800) 848-4123	(800) 866-2436	(800) 345-1518	(800) 613-3355	(800) 344-4825
On-line address	N/A	http://www.amstech.com	http://www.austindirect.com	http://www.ccsicanon.com	chemusa@ix.netcom.com	http://www.compaq.com	http://www.dell.com	http://www.pc.digital.com
Inquiry number	1061	1062	1063	1064	1065	1066	1067	1068



✓ = yes;
N/A = not applicable.

INP = information not provided by vendor

Warranty: P = parts; L = labor;
F = freight to repair center; R = return to customer.

Gateway 2000 Solo S5-133	Hewlett- Packard Co. HP OmniBook 5500 CTS	IBM Corp. ThinkPad 760ED	Impulse Computer Corp. Impulse Duonote	Micro- International, Inc. Mint 5200	NEC Technologies Inc. NEC Versa 6030H	Nimantics Inc. Quanta 6x 133	Sceptre Technologies, Inc. Soundx Series 4000	Texas Instruments, Inc. Extensa 570 CDT	Toshiba America Information Systems, Inc. Tecra 500CDT	WinBook Corp. WinBook FX
\$5599	\$6120	\$6999	\$4599	\$2000	\$5799	\$2999	\$4995	\$2999	\$4999	\$3999
\$5599	\$6120	\$6999	\$4599	\$3600	\$5799	\$3999	\$5679	\$2999	\$4999	\$3999
7.61	7.93	7.60	8.26	7.16	8.52	7.94	7.46	7.93	8.30	8.42
7.3	7.7	7.0	8.5	7.7	8.9	8.6	7.2	7.6	8.2	8.4
8.0	8.9	8.8	8.4	7.9	8.6	8.4	8.0	7.9	8.2	8.3
8.1	8.8	8.1	8.8	6.9	9.4	6.9	8.1	8.8	9.4	9.4
3:4	2:4	3:2	2:7	0:7	2:5	2:6	2:5	2:2	3:0	2:6
Intel Pentium 133	Intel Pentium 133	Intel Pentium 133	Intel Mobile Pentium 133	Intel Pentium 166	Intel Pentium 133	Intel Pentium 133	Intel Pentium 133	Intel P54C 100	Intel P54CLSM 120	Intel Pentium 133
2.9	2.9	3	2.9	3.3	2.9	3.3	2.9	2.9	2.9	3.1
40/40/60 or 70	16/64/70	16/80/70	16/48/60	8/32/60	16/40/70	16/40/60	16/40/70	8/40/70	16/144/60	16/40/70
Synchronous DRAM	Fast-paged	EDO DRAM	EDO	EDO	Fast-paged	DRAM	EDO	Fast-paged	Paged	EDO
256/9	256/15	256/8	32/8	256/60	256/8	256/60	256/60	256/15	256/8	256/8
Intel	SystemSoft	IBM	SystemSoft	SystemSoft	Phoenix/NEC	SystemSoft	Phoenix	Phoenix	Toshiba	Phoenix
Chips & Technologies 65548	Chips & Technologies 65548	Trident Cyber 9385	Chips & Technologies 65548	Cirrus Logic GD7543	Chips & Technologies 65550	Chips & Technologies 65548	NeoMagic 2070 and 2096	Cirrus Logic GD7543	Chips & Technologies 65550	Cirrus Logic GD7543
11.3	12.1	12.1	11.3	12.1	12.1	12.1	12.1	10.4	12.1	11.3
Active-matrix	Active-matrix	Active-matrix	Active-matrix	Active-matrix	Active-matrix	Active-matrix	Active-matrix	Active-matrix	Active-matrix	Active-matrix
800 x 600/256	800 x 600/65,536	800 x 600/256	800 x 600/65,536	800 x 600/65,536	800 x 600/65,536	800 x 600/65,536	800 x 600/256	800 x 600/16,000	800 x 600/16,000	800 x 600/65,536
1/16	1/32	2/64	1/21	2/32	2/64	1/32	1/64	1/32	2/32	1/32
Synchronous DRAM	EDO	VRAM	VRAM	DRAM	Burst-mode EDO	VRAM	EDO DRAM	DRAM	EDO DRAM— burst mode	DRAM
VL-Bus	PCI	PCI	PCI	PCI	PCI	PCI	PCI	PCI	PCI	PCI
1024 x 768/256	1024 x 768/256	1280 x 1024/256	1024 x 768/256	1024 x 768/256	1024 x 768/65,536	1024 x 768/65,536	1024 x 768/256	1024 x 768/256	1280 x 1024/256	1024 x 768/256
2 x 11.8 x 8.8 x 6.7	11.6 x 8.9 x 1.93 x 7	11.7 x 8.3 x 2.14 x 7.38	1.5 x 8.5 x 11 x 6.5	2.1 x 11.8 x 8.9 x 9	2.1 x 11.7 x 9.5 x 9.5	2 x 11.9 x 7.6 x 7.5	1.94 x 11.7 x 8.9 x 6.8	2.2 x 9 x 11.6 x 8.9	2.28 x 11.77 x 9.25 x 8.2	2.15 x 11.3 x 8.98 x 6.8
Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	NMH	Lithium-ion	Lithium-ion	Lithium-ion	NMH	Lithium-ion	Lithium-ion
✓	✓	✓	✓ (suspend mode)	✓	✓ Warm-swappable	✓	✓	✓	✓	✓
IBM	IBMDPRA-21215	IBM	Fujitsu MK-2714T	Toshiba MK-2101MAN	IBM	Toshiba MK-2720FC	IBMSOA-21080	Hitachi DK-212A-B1	Toshiba MK-1301MAV	Toshiba MK-2720FC
EIDE	IDE	IDE	IDE	EIDE	EIDE	IDE	PCIEIDE	IDE	IDE	PCIEIDE
64	INP	256	128	32	Included in Intel's Mobile Tron chip set	128	45	INP	16	128
2000/12	2000/13	1200/12	1088/12	2100/13	1440/13	2100/30	1080/13	1200/16	2500/13	1300/13
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16550	16550	16550	16550	16550	16550	16550	16550	16550	16550	16550
Enhanced	Enhanced	Enhanced	Enhanced, extended, selectable	Enhanced, extended, selectable	Enhanced	Enhanced, extended, selectable	Enhanced	Selectable	INP	Enhanced, extended, selectable
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Touchpad	Trackball	Pointing stick	Touchpad	Touchpad	Touchpad	Touchpad	Touchpad	Touchpad	Pointing stick	Pointing stick or touchpad
2 Type II/1 Type III	2 Type II/1 Type III	2 Type II/1 Type III	2 Type II/1 Type III	2 Type II/1 Type III	2 Type II/1 Type III	2 Type II/2 Type III	2 Type II/1 Type III	2 Type II/1 Type III	2 Type II/1 Type III	2 Type II/1 Type III
ESS 1688	Crystal CS 33242	INP	ESS 1688	ESS 1688	Sound Blaster 16	ESS 1688	ESS 1688	ESS 1688	Crystal	Creative Labs
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	N/A / N/A	Included/included	/optional	Optional/optional	Included/included	Optional/optional	Optional/optional	N/A / N/A	Included/included	/✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓/\$150	✓/\$699	✓/\$499	✓/included	✓/\$200	✓/\$199	✓/\$249	✓/\$699	✓/\$138	NoteDock Enhanced Port Replicator/\$599	✓/\$949
0/0	0/0	0/0	0/0	0/0	0/2	0/0	0/2	1/2	INP/3	0/0
0/0	0/0	0/0	0/0	1/0	1/2	0/0	1/1	1/0	0/1	0/0
1/PLR (805) 232-2000	3/PLR Call local Hewlett- Packard dealer	3/PLFR (914) 766-1900	3/PLFR (905) 858-3000	1/PLR (713) 495-9096	3/PLFR (508) 264-8000	1/PLR (714) 573-4030	1/PLR (818) 369-3698	1/PLFR Call local Texas Instruments dealer	3/PL (714) 583-3000	1/PLR N/A
(800) 846-2000	(800) 443-1254	(800) 772-2227	(800) 668-1111	(800) 967-5667	(800) 388-8888	(800) 886-2671	(800) 788-2878	(800) 848-3927	(800) 457-7777	(800) 468-2162
http://www.gw2k.com	http://www.hp.com	http://www.pc.ibm.com	http://www.impulse.ca	http://www.pcmint.com	http://www.nec.com	http://www.nimantics.com	http://www.sceptretech.com	http://www.ti.com	http://computers.toshiba.com	
1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079

Running on NT

Is Microsoft's Windows NT 4.0 the answer to our OS prayers or just a set of incremental improvements?

By Robert L. Hummel

Without any fanfare, Microsoft has released the long-awaited upgrade to its high-end workstation and server OS products: Windows NT 4.0 Workstation and Server. In contrast to the pop-rock launch for the consumer-oriented Windows 95, Microsoft is aiming NT 4.0 squarely at business users. And with an impressive list of features and performance improvements, NT appears to hit its target.

NT 4.0 seems to promise something for everyone. For Windows 3.x users who want more reason to upgrade than just the pretty face of Win 95, NT 4.0 adds an alluring combination of stability and security. Users get a performance boost, a wide range of new and better features, and enhanced Internet connectivity.

The sweeping changes made to NT 4.0 touch nearly every service and aspect of the OS. It's easy to see signs of upgrades in the interface, management tools, Internet and networking capabilities, programming interfaces, and performance.

Performance

We've had beta versions of the new NT in the BYTE lab for a while. However, it wasn't until Microsoft handed us the final release code—barely in time to make this issue—and we did some real-world testing with the actual OS that we could determine how well NT's performance matches its promotion.

The features table and performance charts on pages 128 and 129 summarize our findings. Except where noted, performance results are for NT 4.0 Workstation. We focused more heavily on Workstation because, to users of Windows 3.x, the target audience for the upgrade, it's unfamiliar. In contrast, those users interested in NT Server are likely already familiar

with NT's capabilities from their experience with version 3.51.

We configured three mainstream systems for testing: a Gateway Pentium-133 with 64 MB of RAM, a Gateway Pentium Pro-150 with 64 MB, and a Cyrix 6x86-P200 with 32 MB. The hard disks in the Gateway systems were connected to the system boards' IDE interface. The Cyrix system used an Adaptec AHA-2940 SCSI adapter and a SCSI hard drive.

Each system was equipped with a PCI-based Matrox Millennium video adapter configured for 1024- by 768-pixel reso-

On the Cyrix system, however, we discovered that a change made to the NT code just before final release produced some surprising results (see the text box "NT 4.0 Bogs Down on Cyrix 6x86" on page 128 for more information).

On the Pentium system, NT 4.0 bested Win 95 in all categories, delivering an average 12 percent performance increase. NT 4.0 showed a stunning improvement of 49 percent in the graphics test and 33 percent in desktop publishing. Microsoft's decision to move the display and print drivers into the kernel (see the Tech Focus on page 130) and its attention to optimization have clearly paid off.

The improvement over NT 3.51 averaged 30 percent. We attribute this seemingly high score to a 45 percent increase in word processing scores and a 40 percent increase in spreadsheet scores, results that are due to the poor performance of 3.51, which fell below that of Win 95 in those categories.

The performance differential between NT 4.0 and Win 95 is much more dramatic on the Pentium Pro system. The Pentium Pro's CPU core is optimized for 32-bit operation at the expense of 16-bit instructions, so it naturally favors NT over Win 95, which is still built around 16-bit DOS code. Improvements in the graphics architecture also contributed to the 68 percent increase in the graphics benchmark.

Again, NT 3.51's lackluster word processing and spreadsheet performance are obvious, allowing Win 95 to turn in better scores, even on the Pentium Pro. In the same tests, NT 4.0 shows increases of 40 percent and 29 percent, respectively. Increases in the other graphics-based tests range from 12 percent to 22 percent.

Windows NT Server 4.0 is also faster than NT 3.51 Server. We compared old

BYTE'S TAKE

WINDOWS NT 4.0

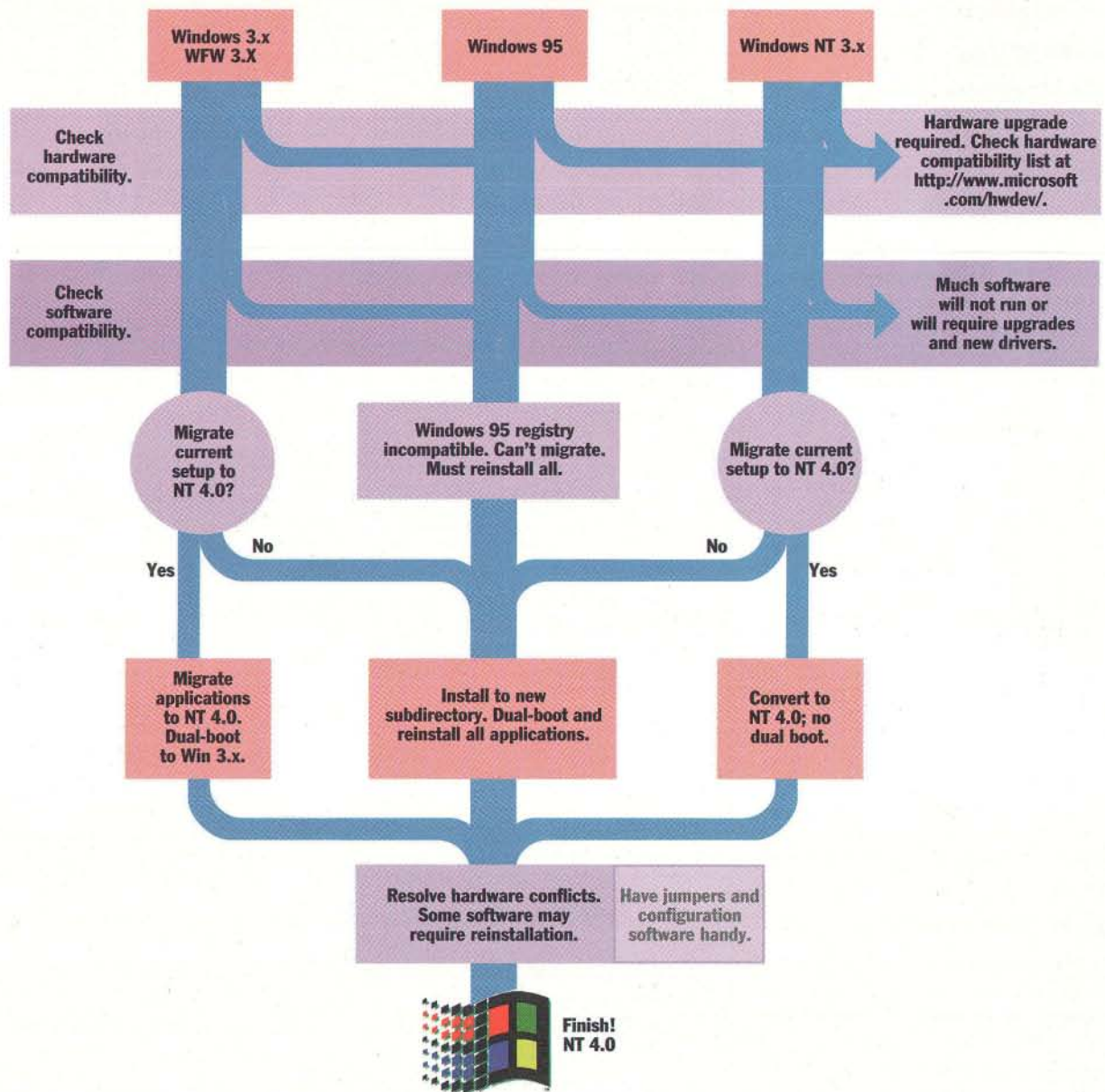
A new (Windows 95) interface, Internet support, and distributed object technology make NT 4.0 worth buying, despite the installation hassles caused by its numerous hardware and software incompatibilities.

lution with 256 colors. Matrox supplied video drivers for Win 95 and NT 3.51, and we used the Microsoft video driver that comes with NT 4.0.

To evaluate performance, we used the new SYSmark/32 1.0 benchmark for Win 95 and NT platforms. This test measures performance in six categories by executing scripts that run eight real-world applications: Adobe PageMaker 6.0, Corel-Draw 6.0, Lotus Freelance 96, Lotus WordPro 96, Microsoft Excel 7.0, PowerPoint 7.0, Word 7.0, and Paradox 7.0.

The results of this first round of tests (see the benchmark charts on page 128) show a clear trend: NT Workstation 4.0 outperforms both NT 3.51 and Win 95.

Upgrade: The Roads to 4.0



Upgrading to NT 4.0 from other versions of Windows can be a low-cost, easy job or an expensive nightmare requiring you to replace much of your hardware and software.

and new Server versions of NT using a SQL server benchmark developed by NSTL (see "Powerhouse Pentium Pro Servers," September BYTE, for test details). Running Microsoft SQL Server 6.5 under both versions of NT Server on a four-processor, 200-MHz ALR Revolution Quad6, we noted a 5 percent overall performance increase under NT 4.0 Server when testing with up to 16 users. The test is CPU- and

memory-intensive and doesn't measure I/O performance.

Interface and Management

Surely the most prominent change to NT 4.0 is the addition of the Win 95 user interface. Present are the familiar Start button, Taskbar, Shortcuts, Network Neighborhood, and My Computer. Also included is Windows NT Explorer, which

provides a hierarchical view of each drive and folder, including network drives.

Desktop management should get easier for system administrators as well. NT's User Profiles and System Policies provide a convenient means to control access to network and desktop resources. System policies help administrators to standardize desktop configurations and enforce behavior. And you can store roaming us-

ers' profiles on an NT server so that users always receive the same desktop, regardless of their location.

Internet Operability

If Internet immersion is the name of the game, then Microsoft is playing for keeps. NT 4.0 includes Internet Explorer (IE) 2.0, Microsoft's Web browser. (Unfortunately, Microsoft released a much-improved version, IE 3.0, shortly after NT 4.0 shipped—too late to make it onto the NT 4.0 CD-ROM.) IE supports existing Hypertext Markup Language (HTML) standards, such as tables, while also incorporating extensions for in-line sound and video, background Secure Sockets Layer (SSL) support, and support for Internet shopping applications.

On NT Server, Internet Information Server (IIS) has been upgraded to version 2.0. Features include easier setup, administration from a Web browser, and support for Systems Management Server (SMS) as well as SNMP administration tools. Microsoft claims that IIS 2.0 is 40 percent faster than the previous version.

Peer Web Services (PWS), a subset of IIS Workstation, enables any user to publish personal Web pages over a corporate intranet. PWS also offers a platform on which to develop and test Web applications. While much more modest than IIS in resource requirements, PWS provides all ISAPI extensions and filters and is integrated into the NT security model.

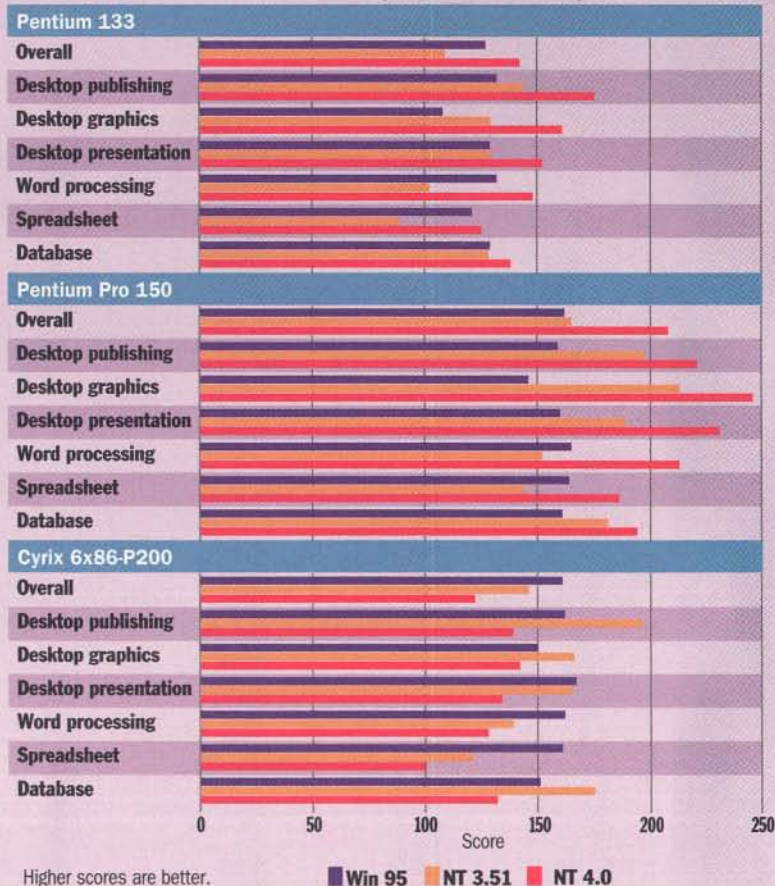
Networking Enhancements

NT Workstation now has an improved version of Client Services for NetWare that supports NetWare Directory Service (NDS). This enables NT users to log in to NetWare 4.x servers running NDS and access files and print resources. It's integrated into NT and offers NDS authentication, browsing and print capability, and full support for NetWare log-in scripts, property pages, and NDS passwords.

The Point-to-Point Tunneling Protocol (PPTP) is an open standard that allows you to use the Internet, or other public carriers, to provide secure connectivity between remote clients and public networks. It also provides the basis for Microsoft's Virtual Private Network (VPN) technology.

Using PPTP, remote users can dial into a local Internet provider and tunnel into their corporate network, seeing the same security and features found on their pri-

NT 4.0 SYSmark/32 Performance (Workstation only)



NT 4.0 Bogs Down on Cyrix 6x86

In testing the final-release candidate of NT Workstation 4.0, BYTE discovered a performance discrepancy when running the software on a Cyrix 6x86-based PC. While running the BAPCo SYSmark/32 suite of 32-bit Windows applications, we noticed a slowdown of 31 percent in the final version of NT 4.0 that was released to manufacturing, compared to the previous release candidate. In both cases, BYTE tested NT on the same PC, which uses the Cyrix 6x86-P200+ running at 150 MHz (see the charts above).

Intel-based PCs running the same NT beta software did not exhibit such a performance decrease from one NT beta to the next. Additionally, NT 4.0 running on the same Pentium system ran the SYSmark/32 applications suite an average of 30 percent faster than NT 3.51, and 12 percent faster than Windows 95. Pentium Pros ran NT 4.0 26 percent faster than NT 3.51, and 28 percent faster than Win 95. The Cyrix 6x86, on the other hand, ran NT 4.0 16 percent slower than NT 3.51, and 24 percent slower than Win 95.

Microsoft added code to NT to change the way it runs on Cyrix-based PCs. Phil Holden, a product manager in Microsoft's Desktop & Business Systems Division, confirmed these changes were made to make NT more stable on the Cyrix platform. This may be the source of the application's performance slowdown. BYTE will have a full report next month.

—Dave Andrews

vate network. From the user's perspective, the physical connection path is irrelevant; the VPN tunnel encapsulates all data in IP packets. VPN supports all the major network protocols, including TCP/IP, IPX/SPX, and NetBEUI.

The updated version of Dial-Up Networking now provides *channel aggregation*, the ability to combine the bandwidth of all available dial-up lines to achieve higher transfer speeds. For example, you can combine two PPP-compliant ISDN B channels or two standard modem lines to double the effective bandwidth. You can also mix ISDN lines with standard analog modem lines.

Two NT server services, Windows Internet Name Service (WINS) and Domain Name System (DNS), have been combined to provide a form of dynamic DNS. Users can enter fully qualified DNS domain names, making it easier to connect to system resources.

NT now supports the Windows Messaging Client, a universal e-mail inbox that includes drivers for Internet and Microsoft mail. Internet support includes the ability to exchange mail over any network with SMTP or Post Office Protocol 3 (POP3) services. Messaging Client includes full MAPI 1.0 support, allowing you to send, receive, organize, and store e-mail and file-system objects.

Network OLE, which is now dubbed Distributed Component Object Model (DCOM), is a step closer to reality in this release. DCOM, a system of software objects designed to be reusable and replaceable, in theory allows you to distribute processes across multiple computers by providing the object-based communications infrastructure. NT 4.0 supports DCOM by hiding the details of application pointers from both the application and the object.

New APIs

NT 4.0 now supports several new or updated APIs. For example, a set of encryption APIs lets developers create applications that work securely over nonsecure networks, such as the Internet.

For instance, Telephony API (TAPI) provides a platform for developing end-user computer telephony and communications applications. TAPI abstracts a wide array of telephone hardware and services, providing a standard programming interface. TAPI hides the actual details of a phone connection from an application in

F E A T U R E S			
	WIN 95	NT 4.0	NT 3.51
Minimum/recommended RAM	8/16	16/32	12/16
Typical disk space required (MB)	40	120	90
Minimum x86 processor	386	486	386
Runs on PowerPC-, Mips-, and DEC Alpha AXP-based RISC systems	✓	✓	✓
486 emulator for RISC machines	N/A	✓	
Scalable: supports multiprocessor configurations		✓	✓
Automatic upgrade path to NT 4.0		N/A	✓
Windows 95-style GUI	✓	✓	
Windows Explorer file browser	✓	✓	
Plug and Play dynamic configuration	✓	(Can use hardware profiles)	
Dynamic PC Card support	✓		
Power management	✓		
System policies to provide centralized control over desktop configuration	✓	✓	
DCOM support		✓	
NTFS support		✓	✓
File compression	VFAT	NTFS	NTFS
Peer-to-peer networking	✓	✓	✓
Peer Web Services		✓	
Windows Internet Name Service		✓	
Client-side NDS support	✓	✓	
PPTP support		✓	
Multilink PPP connections with channel aggregation		✓	
Multimedia API support (DirectPlay, DirectDraw, DirectSound, DirectInput)	✓	✓	
OpenGL 3-D graphics libraries	✓	✓	✓
Direct3D	✓		
Telephony APIs	✓ (version 1.4)	✓ (version 2.0)	
Cryptography APIs		✓	
✓ = yes; N/A = not applicable.			

the same way that a network relieves an application from knowing the physical location of a printer.

NT 4.0 now supports the multimedia APIs introduced in Win 95. DirectDraw provides a device-independent way to access display-dependent features, such as memory, bit block transfer, and color decompression. It also enables digital video playback by taking advantage of the various types of hardware support avail-

enable developers to create games and other applications for NT that were previously limited to Win 95. In addition, the Compact Disk File System (CDFS) has been upgraded to support Auto-Run and CD-XA, the format for video CDs that contain MPEG movies.

Shortcomings

The Plug and Play (PnP) philosophy states that your computer, add-in hardware, and software should work together without user intervention to configure themselves and resolve any conflicts. It's a noble goal, but it's one that NT doesn't yet reach in this release.

As partial compensation, NT supports hardware profiles, allowing users to select from a list of known configurations (e.g., docked and undocked configurations for a notebook computer). Profile variables might include video resolution, network cards, and client services.

Other aspects of PnP can cause problems when you're installing NT 4.0. Interrupt-request (IRQ) and I/O-address conflicts between hardware components that Win 95 resolved, for instance, often stopped our NT installation in its tracks. Whether or not you're using PnP periph-

R A T I N G S				
TECHNOLOGY	★	★	★	
IMPLEMENTATION	★	★	★	★
PERFORMANCE	★	★	★	★

able on video adapters, such as video stretching.

DirectInput offers joystick support and control. The DirectPlay API provides simplified access to communications protocols and on-line services for games. The DirectSound API provides direct control of audio hardware and is designed to enable 3-D audio support in games. Under NT 4.0, however, DirectSound is emulated, and calls get translated to existing Win32 API calls at run time.

Support for these multimedia APIs will

erals, make sure that you know the I/O-address and IRQ requirements for your hardware and have your jumper settings or configuration software and driver disks handy before you begin installation.

Caching disk controllers can also be a problem under NT because a reboot or a power failure could occur before the cache is flushed. Support for caching is limited to the DPT or IBM SCSI adapters for which drivers exist. However, you can use other controllers in write-through mode or with caching disabled.

It's reasonable to expect that some older, obsolete hardware won't be supported in a new OS release. However, NT 4.0 lacks support for wave-table sound on current Sound Blaster PnP sound cards. Support for the ATAPI CD-ROM interfaces on these cards is also nonexistent. Before you plunge into an upgrade, be sure to check out the latest hardware compatibility list at Microsoft's Web site (<http://www.microsoft.com/hwdev>).

In general, applications that attempt to access hardware directly won't work. This includes software to control sound cards, video cards, scanners, and so on. In addition, NT doesn't support virtual device drivers (VxDs), so a lot of multimedia applications, games, and memory management utilities won't work. Other applications may fail due to poor programming practices; for instance, they may refuse to install under NT instead of checking whether the required services are available.

Users of Win 95 might be disappointed that there is no automatic upgrade path to NT 4.0. Microsoft attributes this to differences in registry architectures between the two products and assigns partial blame to applications that store files in different places on the two systems. Installing NT 4.0 on a Win 95 system requires that you install to a new directory and then reinstall all your appli-

PRODUCT INFORMATION

Windows NT 4.0

Workstation: \$319; upgrade, \$149.

Server: five-user license, \$809; 10-user license, \$1129; upgrade from 3.x, \$409 (for first 90 days).

Requires 486 (or higher), Alpha, or other supported RISC chip

Microsoft Corp.

Redmond, WA

(206) 882-8080

fax: (206) 936-7329

<http://www.microsoft.com>

Circle 1081 on Inquiry Card.

TECH FOCUS ARCHITECTURE

Getting to the Kernel: Is NT Still Safe?

To improve NT 4.0's performance, Microsoft moved some of the OS's most critical processes closer to the unprotected code of the microprocessor. Now NT's Graphical Device Interface (GDI)—which handles all writing to the screen—is in the NT Executive; this gives it Ring 0 status and potential access to important system-data structures. Ring 0 is one of the Intel processors' four protection modes, in which OSes typically run trusted or performance-sensitive kernel-level processes, such as file management and keyboard input.

This move raised concern that NT would be less stable and more likely to crash. We seriously considered trying to prove or disprove the point by trying to "break" NT 4.0 with older video cards and drivers. But we quickly realized that such tests would take a lot of work to prove what we already know from analysis: NT 4.0's stability will not be substantially affected by the Ring 0 change.

The real issue is—and always has been—unruly or buggy device drivers. Essentially, they have always been part of the OS and have had low-level control of the CPU. Bad ones will crash NT 4.0, just as they've brought all its predecessors to their knees. Microsoft is trying to steer people away from risky behavior by telling them to use only hardware that's on a Microsoft-approved list. A product's placement on the list means that Microsoft has written and debugged its device driver.

Admittedly, this smacks of a smug solution that serves to place the onus on users while requiring them, in some cases, to buy new hardware when they upgrade to NT 4.0. But again, the same was true with previous versions of NT. We think most corporate buyers of NT are not likely to stumble blindly into hardware conflicts, especially with their mission-critical servers.

It's true that when NT's GDI wasn't in the kernel's memory space, a crash theoretically was more likely to freeze only the screen, leaving background processes intact. We haven't heard of this ever happening, however. Besides, rebooting would be inevitable, since at some point the user would need access to screen output.

Finally, some nervousness about the GDI move to the NT kernel derives from a misunderstanding about what Ring 0 status means. It does not mean that a process has carte blanche to write anywhere in memory that it pleases. Rules exist, but poorly written or malicious drivers have always been able to ignore them.

—Eds.

cations. For advice on the issues and procedures involved, check Microsoft's upgrade paper at <http://www.microsoft.com/networkstation/95tontw.htm>. For an overview of the upgrade process, along with the possible paths and pitfalls, see the figure "Upgrade: The Roads to NT 4.0" on page 127.

Windows' perennial lack of driver support continues to plague this release of NT (by comparison, Win 95 supports approximately 1000 more drivers than NT does). Categories in which NT falls short include video, audio, and PC Card subsystems. The Win32 Driver Model (WDM) is being advanced to address this problem by providing a common set of I/O services and binary-compatible device drivers for future versions of NT and 95.

Finally, if you have been running NT on a 386-based system, Microsoft has a message for you: It's time for you to stop. Performance considerations aside, NT 4.0 is now coded to require a 486 or higher

processor to run on x86-based systems.

Within the limits of the NT architecture, Microsoft has done a good job of supporting hardware peripherals. NT 4.0 recognizes and configures itself automatically for a greater variety of hardware during installation than version 3.51 does. And Microsoft has provided new NT 4.0-style drivers for a wide range of printers and video systems.

There's no doubt that NT 4.0 has a slick interface, powerful features, and raw performance. The more important question is whether it will work with your hardware and software. You'll have to answer those questions yourself, mainly through trial and error. But all in all, NT 4.0's better performance and greater feature set are adequate compensation for any upgrade troubles. **B**

Robert L. Hummel is a computer programmer, consultant, and author. You can reach him at rhummel@monad.net or at editors@bix.com.

Let Microway build your next Graphics Workstation,
Web Server or Personal Supercomputer using

The fastest motherboard on the planet...

500 MHz, 1 GigaFlop

It's a Screamer™

The Microway family of "Screamer" motherboards utilizes the fastest processor to hit the workstation market in the last ten years! The DEC Alpha 21164 not only blows away all other CPUs, but has the VLSI support needed to build memory systems that take full advantage of its numeric speed. Microway Alpha based products set a new standard in price/performance for workstations. The 433/500 MHz Alpha is a clear winner in both the numerics and integer processing arenas. With its ability to issue four pipelined instructions per cycle, the 21164 hits peak speeds of 2000 MOPS. Common numeric operations, such as dot products, peak at a mind-boggling, on-chip throughput of 1 gigaflop! This results in Linpack ratings that go from 150 to 600+ mflops (as vector lengths increase) and scalar rates of 160 to 300 mflops. Systems priced from \$5995 for 300 MHz.

Memory, Cache, PCI . . .

The biggest challenge to running numeric intensive code on CPUs clocked over 200 MHz is building a cache/memory subsystem capable of keeping up with the CPU's numeric units. The 21164's Harvard architecture starts with two 32 deep 64-bit register files, followed by two 8K primary caches and an internal 96K cache. The 21164's external 128-bit data bus gets fed by 2 to 8 MB of Bcache built with 9ns SRAMS. The 256-bit wide interleaved memory subsystem that backs up the Bcache can hold up to 512 MB of DRAM. The coupe de grace is the Screamer's PCI bus interface, which can accommodate both 32- and 64-bit PCI add-in cards. The Screamer is the biggest numeric winner Microway has introduced since we made it possible to run an 8087 in the IBM-PC in 1982!

A motherboard by itself does not a system make.

Microway adds the operating systems and compilers you need to put the 21164 to work. These include NT, Linux, DEC UNIX and OpenVMS, which now run thousands of applications including AutoCad, Excel and Word. The Screamer and Microway's NDP Fortran, C/C++ and Pascal compilers are available to both OEMs and end users.

DEC, Alpha, OpenVMS and DEC UNIX TM Digital.
NT, Excel and Word TM Microsoft. AutoCad TM Auto Desk.
Screamer, NDP Fortran and Microway TM Microway.



And more . . .

Microway also designs DSP cards based on the i860, personal SuperComputers that run up to 24 i860's, Alpha add-in cards and 32-bit globally optimized, RISC-scheduled compilers for the Alpha, Pentium and i860; running on DOS, OS/2, UNIX, Linux, NT, DEC UNIX and OpenVMS. Whether you are an end user or an OEM, our technical staff will gladly configure the correct solution. Since 1982, Microway has earned a solid reputation for designing state-of-the-art products and following up with excellent technical support.

Microway®

Technology You Can Count On

Corporate Headquarters: Research Park, Box 79, Kingston, MA 02364 USA • TEL 508-746-7341 • FAX 508-746-4678
<http://www.microway.com> • info@microway.com • France 33 146229988 • Germany 49 6997650000 • India 91 806637770
• Italy 39 24984655 • Italy 39 27490749 • Japan 81 6 459 3113 • Poland 48 22 487 172 • United Kingdom 44 1815415466

radical technology embedded



New 33MHz Intel386™ EX
embedded processor



QNX RTOS with
Photon microGUI™

QNX
The Leading Realtime OS for PCs

New RadiSys R380EX
system controller



The New EXPLR2: All the hottest embedded technologies on one handy eval board!



Combine the latest products from the leaders in embedded PC technology and what do you get? Faster time-to-market. More functionality with less hardware. A longer production life for your product. And a lot less work.

Intel's EXPLR2 makes your design work easy. All the hardware you need is fully integrated, so you can start prototyping right away.

Intel's EXPLR2 makes your design work easy. All the hardware you need is fully integrated, so you can start prototyping right away. Just cut and paste to create your custom system.

Better yet, the design-capture files come included. The EXPLR2 also comes with QNX, the realtime OS that delivers high-end performance, even on low-cost hardware. Exceptionally small and fully scalable, QNX gives you a POSIX-certified environment and a full-featured GUI in under 1MB of memory!

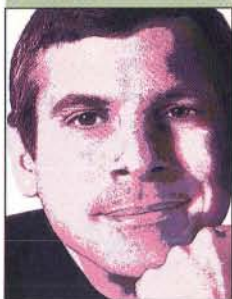
The EXPLR2 comes with something else. Commitment. With their long-term commitment to embedded applications, Intel, RadiSys, and QNX Software Systems are the right companies to give your designs a real future. **Radical!**

For your free reference design kit,
surf: **www.explr2.com**
or call: **800 862-1883**
(to order a board, contact your Intel distributor)

Circle 153 on Inquiry Card.

Intel and Intel386 are registered trademarks of Intel Corporation.
QNX is a registered trademark and Photon microGUI is a trademark of QNX Software Systems.
RadiSys is a registered trademark of RadiSys Corporation.

Web Project



Web Surveys

*Helpful techniques
for Web-based data
collection and analysis.*

The BYTE Site is, among other things, a giant survey application. Each of its 6000+ archive pages presents a link to a feedback form. Or rather, as I explained last October (<http://www.byte.com/art/9510/sec9/art1.htm>), to a script that generates a form that's customized for each article. Recently, I began harvesting this data to answer questions like "How highly do site visitors rate State of the Art articles?" and "How often do site visitors say they read BYTE magazine?" We've also run Web surveys to ask visitors about their experiences with ISDN, assessment of uninterruptible power supplies (UPSes), and OS preferences.

Along the way, I've refined the techniques and tools I use to capture, store, and analyze survey data. I hope you'll find them useful for surveys and other kinds of Web-based data collection and analysis.

The Form

I tend to bail out when confronted by a sprawling multipart Web form, and I assume you do, too. So I try to make my own forms as concise as possible—ideally, just a single screen. The most effective space-saving device is the Hypertext Markup Language (HTML) `<select>` tag. The drop-down lists that it creates ask multiple-choice questions far more compactly than arrays of radio buttons or checkboxes can. Forms built with drop-down lists render more quickly. Browsers tend to struggle when given too many discrete form elements.

While I prefer the drop-down list, two circumstances militate against its use: multiple selection and no sensible default.

<http://www.byte.com/>

Web Project Conference

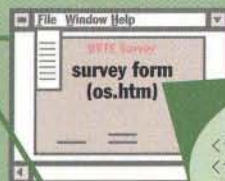
One Form, Many Uses

① The survey form is read by a Perl script . . .

② . . . that produces two script outputs.

③ `Os.pl` is a Perl script that logs survey responses.

④ `Os.sql` is a SQL script that creates a database.



Underlying HTML

```
<form action="os.pl">
<input type="text"
name="email"
dbtype="char(60)">
```

Underlying PERL

```
require 'cgi-lib.pl';
foreach $key (keys %input)
{print SVY "$key",
'$input{$key}';}
```

Underlying SQL

```
create table os
(id integer,
email char(60))
```

id	e-mail

001.svy

002.svy

003.svy

```
%record=(
'name','John Smith',
'email','jsmith@smith.com');
```

sqlload.pl

④ This Perl script reads logged responses and populates the database.

id	e-mail
John Smith	jsmith@reader.com

BENEFITS

- Record field names in one place: the HTML form.
- Automatically generate the Perl CGI script that processes the form.
- Automatically generate the SQL script that creates the database.
- Reuse the script that loads the database.

The `<select>` tag does, of course, support multiple selection. You simply add the attribute `multiple="yes."` However, a multiselect drop-down list looks the same as a single-select one. No visual cues tell you that multiple selection is available or that Ctrl-click is the way to operate it. Explaining these things chews up screen space. If the number of choices is not too large, you may be better off with a self-explanatory set of checkboxes.

Without a sensible default choice, there's a similar trade-off between a drop-down list and checkboxes. A drop-down list always returns a value; a checkbox set may not. To differentiate a passive "no reply" choice from a drop-down list's active choices, you have to encode it explicitly as the default choice. You can use that item to document the drop-down list (e.g., "multiselect from below"). Still, I'm never quite comfortable with the semantic inconsistency of this approach. Again, you need to weigh the compactness of the drop-down list against the elegance of a checkbox set.

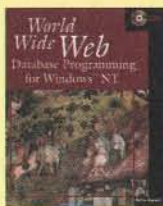
To lay out your forms, you can use an HTML editor, or you can just clone an existing form and tweak it with a text editor. I do the latter; HTML widgets are really quite simple. To simplify layout, I enclose elements between a `<pre>...</pre>` tag pair that specifies monospacing and hard newlines. Within this preformatted region, you can still use `<strong>` (bold), `<em>` (italic), or even Netscape `<font size>` tags to clarify the organization of the form.

The Database

For surveys and other data-collection applications, there's no reason to wire the form directly to a database unless you need the information available in real time. Dumping records into structured text files is a simple, low-overhead, and highly effective solution. For example, the BYTE on-line archive logs feedback as a set of files, each containing a single ASCII-delimited record. The concatenation of this set of files forms a database import file.

When I began harvesting this data, though, I ran into a few limitations. The import records weren't self-descriptive—that is, they didn't carry field names along with values. Lacking names, an import tool must rely on an ordering of fields defined elsewhere. Many import tools allow a special first row of field names. But including such a row in each record

BOOKNOTE



World Wide Web Database Programming for Windows NT (\$39.95)

by Brian Jepson
John Wiley and Sons

<http://www.wiley.com/compbooks/>
A great Perl-oriented tutorial for NT-based Web developers.

wouldn't solve another problem—poor handling of multiline text data.

The surveys I run usually ask both quantitative questions ("How much did your ISDN installation cost?") and qualitative ones ("What was your ISDN experience like?"). No one tool is best suited to analysis of these two very different types of data. You want a relational database or statistics package for the quantitative data and a text database (possibly a searchable HTML archive) for the qualitative data. How can you store information destined for either or both of these repositories? I've settled on a text representation of a Perl associative array:

```
%record =  
( 'name1', "val1", 'name2', "val2" );
```

If you process the form data with a Perl Common Gateway Interface (CGI) script that uses `cgi-lib` (<http://www.bio.cam.ac.uk/cgi-lib/>) or an equivalent library, you're given an in-memory structure of this type. Unfortunately, Perl lacks a primitive function to ASCII-ize such structures, but it's not difficult:

```
foreach $f (keys %record) {  
    s/"/\\"/g;  
    print RECORD  
    "'".$f."\'','\"".${$f}."\"'\n";  
}
```

As long as you take care to convert double-quote to backslash-double-quote, as shown here, this technique handles multiline text fields nicely.

If the file handle `RECORD` maps to the file `0001.REC`, a subsequent Perl script can parse and reconstitute the `%record` array with the single statement

```
do '0001.REC';
```

What's the point of all this? It's now trivial to write Perl scripts that transform collections of such files into a variety of

database import formats or directly to an HTML textbase. For relational analysis, `sqlload.pl` (<http://www.byte.com/art/download/sqlload.pl>) produces a SQL load file containing a bunch of `INSERT INTO` statements. For textual analysis, I use variants of another script that builds a simple, navigable Web archive.

The Tool

Tools that marry Web forms to databases tend to assume, reasonably enough, that you're acquiring data directly into a database. They typically use templated HTML forms containing triggers that read or write database fields. For a survey, however, it's convenient to separate data collection from database import—particularly when you're building both relational and textual databases from a common data set. Thus, there's no reason to use a template-oriented tool such as Cold Fusion or the Microsoft Internet Information Server (IIS) Internet Database Connector (IDC).

What's more, I've found that these products don't simplify database book-keeping to the degree I'd like. They assume that you'll build both an HTML template and a corresponding database schema. You end up with two sets of field names that you have to maintain in sync. It's not a big deal, but life's short and I'm lazy, so I wrote `form2db.pl` (<http://www.byte.com/art/download/form2db.pl>) to generate a database schema automatically from an HTML form. This Perl script relies on the fact that browsers will quite happily ignore user-defined HTML attributes. For example, browsers render the input text box described by the following code:

```
<input type="text" name="email"  
dbtype="char (50)">
```

which is the same as

```
<input type="text" name="email">
```

The `dbtype` attribute, which I simply

TOOLWATCH

gnu-win32

(free at: <ftp://ftp.cygnus.com/pub/gnu-win32/latest>)

Cygnus Support

Mountain View, CA

<http://www.cygnus.com>

The gnu tools and libraries—gcc, bash, grep, bison, the lot—for NT (x86 and PowerPC).

MAXIMIZE YOUR MARKETING DOLLARS WITH BYTE REPRINTS!

BYTE Reprints serve as high-quality, inexpensive promotional tools for:

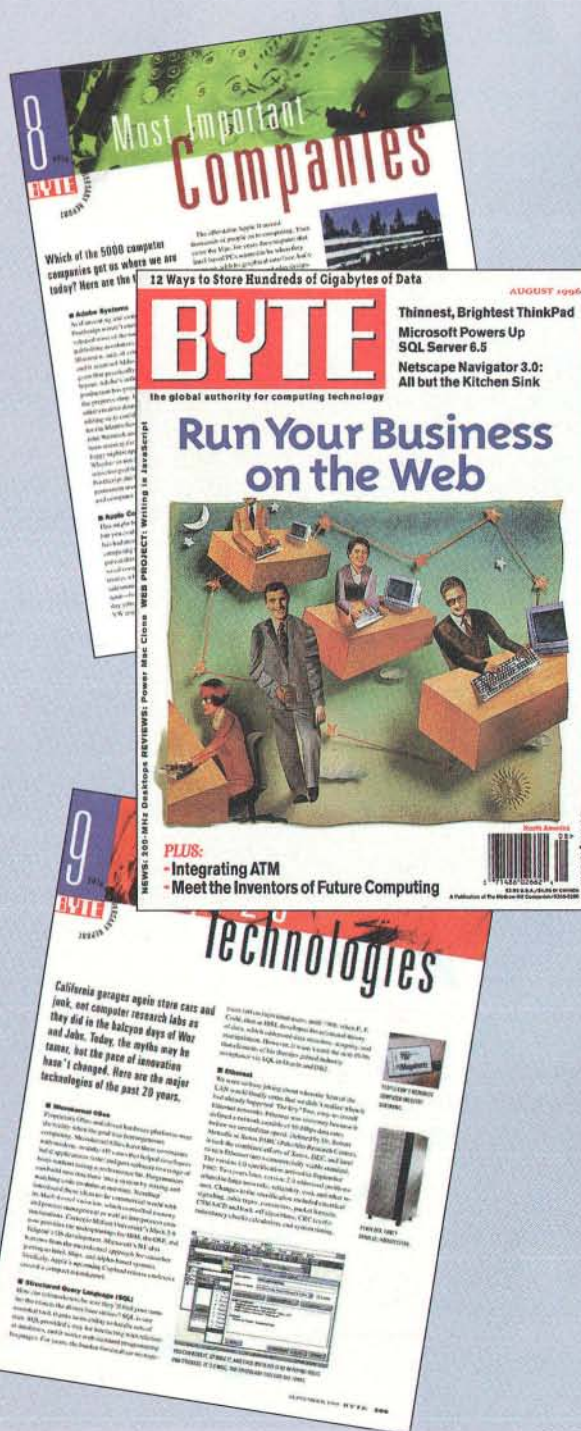
- Trade show handouts
- Direct mail campaigns
- Dealer/distributor promotions
- Training and educating key personnel
- Presentations at conferences/seminars

And there's more!

- BYTE article reprints are NOW AVAILABLE in hard-copy and electronic formats
- BYTE reprints can be customized with your company name, logo, product picture, etc.

Call today for information and quantity prices.

Susan Monkton
BYTE Reprint Department
One Phoenix Mill Lane
Peterborough, NH 03458
Phone: 603-924-2618
Fax: 603-924-2683
E-Mail: smonkton@mcgraw-hill.com

BYTE

A Division of The McGraw-Hill Companies

Using the Perl 5 ODBC Module

```
use NT::ODBC; $o = new NT::ODBC("DSN=os");

@use_cli = ('use_cli_mac', 'use_cli_os2', 'use_cli_w95',
'use_cli_nt', 'use_cli_unix', 'use_cli_w3x');
foreach $s (@use_cli, @use_srv) {
    if ($o->sql("select $s, count(*) from $view group by $s") !=
    0)
        { die; };
    print "\n": &printData; }

sub printData {
    local ($data);
    while ($o->fetchrow) {foreach $f ($o->field names) {
        $data = $o->data($f); print $data . "\t"; } print "\n"; } }
```

invented, means nothing to browsers. However, when I write forms using this attribute, they can double as database schemata. Form2db.pl parses these enhance forms and emits a SQL CREATE statement. Do you have to abandon your HTML editor if you go this route? Not if it's a smart one that knows how to preserve user-defined HTML. Adobe, for example, says PageMill 2.0 will do this.

There's still more mileage to be gotten out of form2db.pl. I've said that I store each record initially as an ASCII-ized Perl associative array. That implies a CGI script, wired to the form, that writes the ASCII file. It's a simple CGI script—so simple, in fact, that form2db.pl can create it automatically. When I wrote the form for our OS survey, for example, I pretended that the script os.pl already existed:

```
<form action="os.pl">
```

When form2db.pl reads this form, it makes the imaginary script real. The single occurrence of the name os in the form tag drives several related processes. It becomes the name of the table created by form2db.pl's SQL CREATE output, the name of the file containing that output, and the name of the subdirectory in which os.pl deposits records. The figure "One Form, Many Uses" on page 133 summarizes these interactions.

The Analysis

In July's ToolWatch, I mentioned iodbc (<ftp://ftp.digex.net/pub/access/psii/iodbc.zip>), a command-line interface to the Open Database Connectivity (ODBC) subsystem on Windows 95 and NT. It's the thinnest-imaginable ODBC wrapper, and therein lies its strength. To load the OS survey data into a database, I used ODBC

Administrator to create a new data source called OS. (The driver was MS Jet 3.0 and the format was .mdb, but I could have used any database supported by ODBC.) I then issued one command to execute the SQL CREATE code written by form2db.pl:

```
iodbc -S OS < os.sql
```

and another to execute the SQL INSERT INTO code written by sqlload.pl:

```
iodbc -S OS < os.load
```

Then I launched iodbc in interactive mode to begin exploring the data set:

```
iodbc -S os
1> select count(*) from os
```

This approach makes me a knuckle-scraping Neanderthal or an avant-garde minimalist, depending on your perspective. I see it the latter way, because I find that operating a full-blown wizard-equipped GUI database can take more time and effort than just typing the small bits of SQL you need. What's more, as you write those SQL statements, you discover patterns—that is, opportunities to parameterize and automate SQL queries.

Perl coupled with iodbc is one way to exploit those opportunities, but it's awkward. Perl has to write SQL statements to a file, invoke iodbc on that file, and then parse iodbc's output. A better solution is odbcpm, a Perl 5 module that makes ODBC SqlExecute and SqlFetch calls directly available to Perl programs. This has two major advantages: The SQL code doesn't have to take a trip through the file system, and its output comes back neatly chunked by row and column.

These two methods are complementary. I use iodbc when first exploring a data set and odbcpm to codify the repeatable pat-

terns that emerge from that exploration. Today, all this happens on my NT systems only because, while ODBC itself is available for Unix, iodbc and odbcpm are not yet available. But the Perl scripts I'm distributing with this article will work fine on Unix, as will the generic SQL code they produce. If you're in need of a lightweight Unix SQL engine to use in conjunction with these, try msqldb (<http://www.bunyip.com/>).

The Methodology

What did our OS survey reveal? Nothing of value, I'm afraid. I got so absorbed in the mechanics of Web-based data collection and analysis that I ignored the most fundamental survey precept. BYTE senior editor Tom R. Halfhill puts it succinctly: "You can't let the studied population select itself." Team OS/2, an international band of OS/2 enthusiasts, drove that point home with a vengeance.

Two days into the survey, analysis showed that usage of the Mac OS, OS/2, Unix, and various Windows flavors—on desktops and servers—was comparable to what many other sources have reported. A few days later, Team OS/2 struck, and OS/2's numbers soared. An Alta Vista search of the Usenet uncovered one cause of the surge—a posting to comp.os.os2.advocacy, which contained the uniform resource locator (URL) of the survey page.

We reported the results in last month's Bits section on page 32. However, please don't quote the three pie charts, which show OS/2's dominance, without also quoting the portion of text showing that an OS survey response was 12 times more likely to come from the Internet domains ibm.com and ibm.net than was a typical BYTE Site visit.

We'll continue to run surveys on The BYTE Site. The anecdotal information we've gathered, for example from the ISDN survey, seems valuable as an indicator of trends and opinions. Quantitative data may have some limited value as well, on subjects charged with less religious fervor. However, we won't put much stock in the numbers until we can invite true random samples of participants, probably from a (yet-to-be-developed) site-registration database. For that valuable lesson learned, we have Team OS/2 to thank. **B**

Jon Udell is BYTE's executive editor for new media. You can contact him at jon_u@dev5.byte.com.

OPERATING INSTRUCTIONS,
 AS DESIGNED BY NETWORK
 PROFESSIONALS.



PC-TO-UNIX
 CONNECTIVITY, AS DESIGNED BY
 NETWORK PROFESSIONALS.



New
WINDOWS NT
 Version Available!

If everything were made to your specifications, life would be simple.

WRQ can't make everything a one-step operation. But WRQ's Reflection® makes PC-to-UNIX connectivity for Windows™ about as simple as it can be.

The Reflection Suite for X starts with a 32-bit, X11R6 PC X server that delivers accelerated performance with proven reliability. Then, it adds a full range of applications and emulations, an award-winning TCP/IP stack, an NFS client, and Internet tools. It's all in one powerful package, with an integrated installation.

REFLECTION X/REFLECTION SUITE FOR X

- ▲ **ARCHITECTURE:** 32-BIT WITH WINDOWS ACCELERATED VIDEO ENHANCEMENTS (WAVE); X11R6 COMPLIANCE; OPTIMIZED FOR WINDOWS 95
- ▲ **INTEGRATION TOOLS:** DIAL-UP X, CONFIGURABLE PANNING, VIRTUAL SCREEN, BACKING STORE, REMOTE AND LOCAL WINDOW MANAGEMENT
- ▲ **TCP/IP AND APPLICATIONS:** VT420, VT320, SCO ANSI, LPR/LPD, NFS, DHCP, SNMP MIB II, FTP, INTERNET APPLICATIONS
- ▲ **MANAGEMENT TOOLS:** X TRACE UTILITY WITH CUSTOMIZED FILTERS, QUICK-START CONNECTION TEMPLATES, CENTRALIZED SITE ADMINISTRATION

WRQ OFFERS REFLECTION PC-TO-HOST AND NETWORKING CONNECTIVITY FOR UNIX, X, HP, DIGITAL, AND IBM SYSTEMS.

Try Reflection, today, for PC-to-UNIX connectivity that runs as smoothly as clockwork.



Call for a free demonstration copy:

Argentina—TCW Argentina S.A. (1) 314 5010 Australia—Megatec Pty, Ltd. 1 800 806 563
 Austria—SIS Informationstechnologie Ges.m.b.H. (01) 368 65 00 112 Benelux—BMC
 Software Services (070) 416 57 57 Computing & Systems Consultants bv (040) 23 33 555
 Brazil—Nutec Informática S.A. (011) 5505 5728 Chile—S & A Consultores (2) 235 0289
 Czech Republic—INSEKO CS (067) 607 311 Denmark—Tempest A/S 4494 8902 Finland—
 TT-Professional Solution Oy (90) 3294 7600 France—ADE (Toulouse) (16) 61 00 32 32
 Germany—Computing & Systems Consultants GmbH (0211) 53 70 01 6 Wick Hill
 Kommunikationstechnik GmbH (040) 23 73 01 0 Hong Kong—Global Technology
 Integrator Ltd. 2881 4800 Indonesia—P.T. Summitra Solusindo (021) 659 8886 Ireland—
 Entropy Ltd. (01) 2940199 Israel—Yana Systems Ltd. (03) 557 3636 Italy—Siosistemi srl
 (030) 24411 Japan—Cybernet Systems (03) 5978 5453 Malaysia—SCS Computer Systems
 Sdn. Bhd (03) 756 5800 Mexico—Infosistemas Financieros (5) 813 1325 New Zealand—
 Interconnect (09) 358 0322 Norway—NOCOM Norge A/S 67581450 Poland—Softkom
 Sp. z o.o. (22) 6356346 Portugal—Silicon (01) 795 85 85 Singapore—MicroAsia Pte. Ltd.
 441 2600 Slovak Republic—INSEKO a.s. (089) 64 88 08 Slovenia—SI d.o.o.
 (061) 161 11 57 South Africa—LAN Design (011) 239 5000 Spain—Scorpion Sistemas
 S.A. (93) 485 40 44 Sweden—NOCOM AB (018) 65 55 00 Switzerland—Commcare AG
 (01) 730 24 31 Taiwan—Ivan Information Technology Co. (02) 517 7012 Thailand—
 MultiLink Co., Ltd. (2) 318 8505-7 United Kingdom—Wick Hill Limited (01483) 772280
 Venezuela—Lanka Sistemas (2) 959 2411

WRQ Reflection
 CONNECTIVITY FOR A CHANGING WORLD

The Office of the Future—Today!

Offering the world's most innovative business software and a new dimension in power, functionality and Internet support, Corel® Office Professional 7 is the **first** office suite that allows you to publish to the Java™ Language using Corel Barista™ technology. Imagine having the ability to publish all of your existing files, exactly as they appear, to the World Wide Web. Finally, technology that delivers Web pages the way you envisaged them. No more pale imitations. No more programming. No more re-formatting. Just stellar Web documents.

Corel Office Professional 7 gives you all this plus the most robust set of industry-leading business applications available in an office suite. And for added convenience, you'll find that all core applications are compatible with most competitive software. Go beyond traditional document creation. Experience tomorrow's office software—today!

COREL Office Professional 7

Corel® WordPerfect® 7

WordPerfect's extensive cross-platform compatibility is a must for optimum enterprise-wide communications. Corel WordPerfect 7's innovative new features, exclusive tools and superior Internet support continue to make it the word processor of choice for any office.

Plus Value-Added Features and Applications!

- CorelDRAW™ 6 illustration module - an incredibly fast and powerful graphics application
- CorelFLOW™ 3 - for high-impact business graphics
- Sidekick™ 95 - an innovative personal organizer
- Corel® Time Line® - the ultimate project management software
- Netscape Navigator™ Internet browser
- Dashboard™ 95 - desktop application launcher
- InfoCentral™ 7 - a powerful database information manager
- GroupWise™ 4.1 client license†
- Corel® A to Z - an extensive electronic reference tool
- Envoy™ 7 - a versatile electronic document publisher
- Corel Barista™ technology (in Corel® WordPerfect® 7, Corel® Quattro® Pro 7 and Corel® Presentations™ 7)
- Quick View Plus® - view over 200 document formats
- IBM® VoiceType™ Control (core applications only)
- 1,000 top-quality fonts
- 10,000 clipart images with full-color reference guide

Corel® Quattro® Pro 7

Analyzing and presenting data has never been more intuitive! With more @functions than the competition, file compatibility with Lotus® 1-2-3® and Microsoft® Excel plus extensive Internet connectivity, Corel Quattro Pro 7 is simply the most comprehensive spreadsheet available.

Paradox® 7

Paradox 7 delivers a winning combination of ease of use, performance and powerful application development—plus ultra-smooth integration with Corel WordPerfect 7 and Corel Quattro Pro 7.

Corel® Presentations™ 7

When you need to inform, educate or persuade, Corel Presentations 7 will put the Internet to work for you—it's an incredibly effective way to convince your audience.

\$419⁰⁰*
Full CD-ROM version

\$219⁰⁰*
Competitive upgrade CD-ROM version

Since 1982
ComputAbility
Consumer Electronics
Call Now!

1-800-811-2023

*US\$ plus applicable taxes.

KUR-0221-US



<http://www.wordperfect.com>
Call now for faxed literature!
1-613-728-0826 ext. 3080
Document # 1176

Circle 132 on Inquiry Card.

†Single-user client license for GroupWise 4.1 only. No actual software or documentation included.

Corel, WordPerfect and Quattro are registered trademarks and Presentations, CorelDRAW, Barista, CorelFLOW and InfoCentral are trademarks of Corel Corporation or Corel Corporation Limited. Envoy is a trademark of Novell, Inc. Netscape Navigator is a trademark of Netscape Communications Corp. Paradox is a registered trademark of Borland International, Inc. Sidekick and Dashboard are trademarks of Starfish Software Inc. Time Line is a registered trademark of Time Line Solutions Corporation. IBM is a registered trademark and VoiceType is a trademark of IBM Corporation. Quick View Plus is a registered trademark of INSO Corporation. Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. All other company and product names are trademarks or registered trademarks of their respective corporations.

CDs for the Gigabyte Era

Next-generation optical disks, due this year, offer capacities that are 25 times higher than a CD-ROM's.

By Tom R. Halfhill

DVD is Goliath. Various defined as digital versatile disc, digital videodisc, or simply a generic trade name, DVD is the next-generation optical disk standard that will bring gigabytes to your desktop. DVDs are the same physical size as today's CDs, but in terms of storage capacity, they're giants: 4.7 to 17 GB per disc, depending on the format. These sizes are up to 25 times the maximum capacity of conventional CDs, whose 682-MB size seemed unimaginably vast only a few years ago.

Like the biblical Goliath, however, DVD has some vulnerabilities. Last summer, unresolved differences over standards and copyright-protection issues were delaying its launch. It was supposed to make a big splash this fall, but don't expect to see significant numbers of drives or discs until next year. That means DVD will compete with the new CD Erasable (CD-E) format, which will also debut in 1997. Many users will prefer a rewritable CD drive to a read-only DVD drive. DVD-RAM is still a few years away.

Still, the insatiable demand of computer users for gigabyte-size storage media will eventually win out. The long-term success of DVD-ROM, DVD Recordable (DVD-R), and DVD-RAM seems virtually guaranteed.

Never Enough

The extra space won't go to waste. Multimedia software eats megabytes for breakfast, and growing numbers of companies are distributing documents, databases, and software on CD-ROMs. A higher-density disc will let them consolidate multi-volume sets of CD-ROMs on a single DVD-ROM. Moreover, DVD is fast: The first DVD-ROM drives (which should sell for about \$500-\$600) will be roughly equivalent to a 9x CD-ROM drive, and DVD's greater capacity reduces the need to swap discs.

For example, the popular PhoneDisc PowerFinder USA from Digital Directory Assistance requires six CD-ROMs to store 112 million phone listings. Even with a CD-ROM changer, disc-swapping is slow. In June, the company demonstrated its new DVD version. The entire 3.7-GB database, with the same number of listings, fits on a single DVD-ROM, with room to spare.

Entertainment software will get a boost, too. Multimedia developers are running out of space on CD-ROMs for their increasingly realistic graphics, video clips, and stereo soundtracks. Games such as Sierra's Phantasmagoria—which fills seven CD-ROMs—could easily fit on one DVD-ROM.

DVD isn't just for computers. Hollywood movie studios want to replace VHS videocassettes with DVD video in the rental and retail markets. The discs are much cheaper to manufacture than VHS tapes (about 80 cents compared to \$2.20), occupy less shelf space, never need rewinding, deliver higher-quality video, and can accommodate multiple-language soundtracks and subtitles.

The music industry is also expressing some interest in the evolving DVD standard. More data means higher sampling rates and longer playing times, so DVDs could surpass the fi-

delity and convenience of regular CDs.

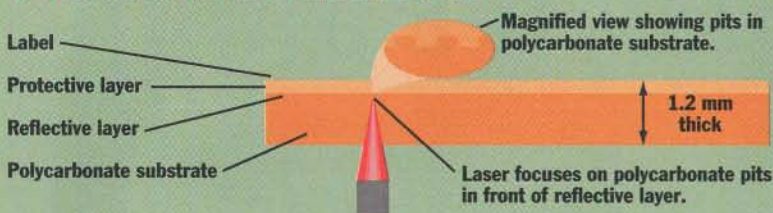
To ensure the success of this new medium, the computer and entertainment industries are hammering out a worldwide standard. DVDs won't work with existing equipment, of course, but new DVD-ROM drives will read several variations of the DVD format. Optionally, the DVD drives will be designed to also support some future formats that are still evolving, such as write-once DVD-R and rewritable DVD-RAM.

continued

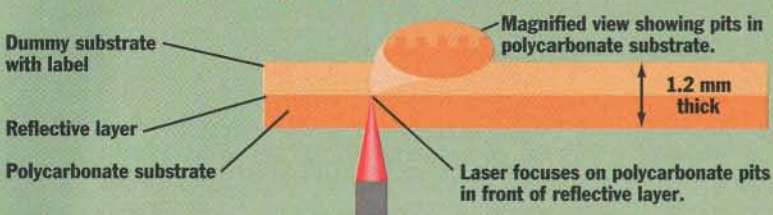


CD-ROM vs. DVD-ROM

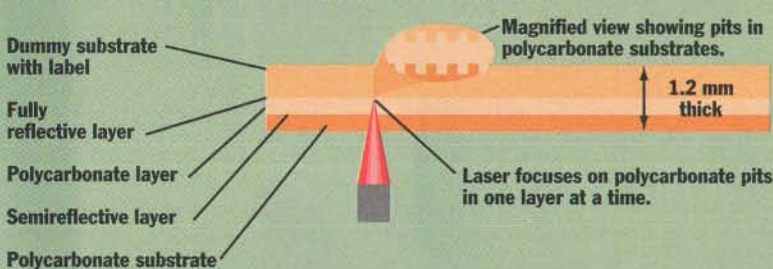
① Conventional CD-ROM Capacity: 682 MB



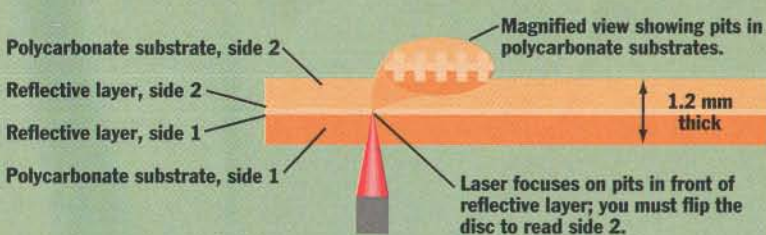
② DVD-ROM Single-sided, single-layer Capacity: 4.7 GB



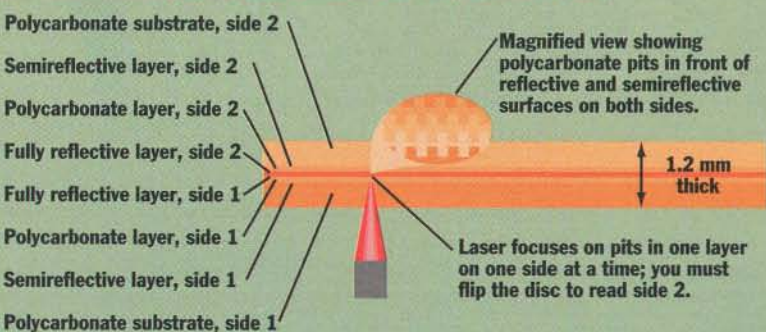
③ DVD-ROM Single-sided, dual-layer Capacity: 8.5 GB



④ DVD-ROM Double-sided, single-layer Capacity: 9.4 GB



⑤ DVD-ROM Double-sided, dual-layer Capacity: 17 GB



Even though the DVD standard does not mandate backward compatibility, it's highly likely that DVD-ROM drives will read existing CD-ROM and CD Recordable (CD-R) discs. Likewise, the DVD video and audio players sold to consumers will almost certainly play audio CDs and maybe other CD-based formats, such as CD Interactive (CD-I) and CD Video. There's even talk about a hybrid disc that stores data at CD and DVD densities in separate layers on a single platter.

Despite its storage capacity and the array of format choices, DVD faces some serious challenges in the consumer market. For DVD video to catch on, the studios must release enough movies in this format to make the players a worthwhile purchase. Also, it may possibly be several years before recordable DVD video decks appear. They will need real-time MPEG-2 compression to fit 2 hours of video on a disc, and implementing real-time MPEG-2 currently costs tens of thousands of dollars.

Even if you care about DVD only to store corporate data or distribute sales presentations, what happens in the consumer market is quite important. DVD-ROM prices will remain high if there is no consumer market to drive down the manufacturing costs.

The Many Sides of DVD

The most amazing (and confusing) thing about DVD is its plethora of physical formats. There are more than a dozen possible variations, though only a few will likely be popular (see the table "DVD Physical Formats" on page 142). Fortunately, most DVD drives will automatically recognize all formats, so DVDs should be as easy to use as CDs.

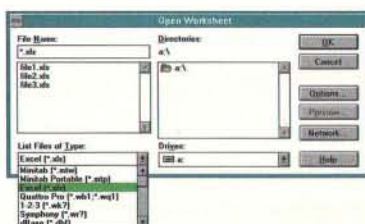
The multitude of formats is a radical departure from the CD standard. CDs always store data at the same density on a single-sided disc. The capacity varies only by how closely the outward-bound spiral data track approaches the disc's outer rim. Most CD-ROMs settle for a conservative 553 MB. Some discs stretch it to 682 MB by living close to the edge. It's risky because the outer region of a disc is more susceptible to defects, and some drives have trouble reading the longer track.

DVD achieves its greater capacity in four ways. The first two methods take advantage of improved manufacturing techniques and shorter-wavelength lasers. CDs and DVDs store data in the form of

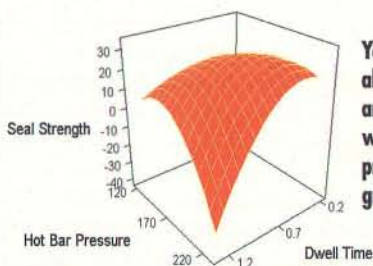
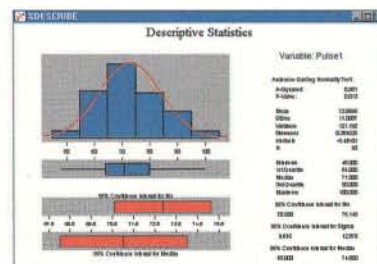
For over 20 years in over 80 countries, users have experienced the power and simplicity of MINITAB Statistical Software. Used in businesses from start-ups to Fortune 500 companies, MINITAB is:

- **Powerful and comprehensive** – an “all in one” statistical software package from basic to complex statistical functions
- **Easy to use** – with dialog boxes and prompts every step of the way
- **Easy for data entry or importing** – enter data into MINITAB worksheets or import data from Excel®, Lotus® and other programs
- **Ready to use right out of the box** – with MINITAB Statistical Software, there is no lengthy learning process and a simple and quick tutorial gets you working right away
- **Available on multiple platforms** – MINITAB Statistical Software runs on Windows® '95, Windows® 3.1, Windows NT™, Macintosh and Power Macintosh
- **Fully supported** – on-line HELP is easy and quick plus skilled technical specialists are just a phone call away
- **Affordable** – priced under US \$1,000
- **Guaranteed** – when you purchase directly from MINITAB, you receive our unconditional 30-day, money-back guarantee

**Moving data
between MINITAB
and other packages,
including Excel and
Lotus is a breeze**



**With MINITAB's
wide range of
analytical tools,
you have complete
flexibility in
analyzing your data.**



**Your data comes
alive quickly
and attractively
with MINITAB's
presentation
graphics.**

The screenshot shows a Microsoft Excel spreadsheet with the following data:

	Country	GDP	18	17	18	18
1	United States	18,760	18,760	18,760	18,760	18,760
2	China	13,900	13,900	13,900	13,900	13,900
3	Germany	3,500	3,500	3,500	3,500	3,500
4	France	2,700	2,700	2,700	2,700	2,700
5	United Kingdom	2,500	2,500	2,500	2,500	2,500
6	Italy	2,100	2,100	2,100	2,100	2,100
7	Spain	1,400	1,400	1,400	1,400	1,400
8	Japan	4,500	4,500	4,500	4,500	4,500
9	South Korea	1,100	1,100	1,100	1,100	1,100
10	India	1,800	1,800	1,800	1,800	1,800
11	Canada	1,600	1,600	1,600	1,600	1,600
12	Brazil	1,500	1,500	1,500	1,500	1,500
13	Mexico	1,200	1,200	1,200	1,200	1,200
14	Russia	1,100	1,100	1,100	1,100	1,100
15	South Africa	210	210	210	210	210
16	Australia	1,100	1,100	1,100	1,100	1,100
17	Sweden	500	500	500	500	500
18	Norway	470	470	470	470	470
19	Denmark	460	460	460	460	460
20	Ireland	400	400	400	400	400
21	Belgium	370	370	370	370	370
22	Netherlands	520	520	520	520	520
23	Portugal	250	250	250	250	250
24	Greece	200	200	200	200	200
25	Poland	1,100	1,100	1,100	1,100	1,100
26	Czech Republic	150	150	150	150	150
27	Slovakia	110	110	110	110	110
28	Hungary	110	110	110	110	110
29	Slovenia	47	47	47	47	47
30	Lithuania	18	18	18	18	18
31	Latvia	18	18	18	18	18
32	Estonia	18	18	18	18	18
33	Finland	240	240	240	240	240
34	Israel	40	40	40	40	40
35	Turkey	750	750	750	750	750
36	Argentina	450	450	450	450	450
37	Colombia	150	150	150	150	150
38	Venezuela	280	280	280	280	280
39	Chile	180	180	180	180	180
40	Peru	170	170	170	170	170
41	Ecuador	100	100	100	100	100
42	Bolivia	100	100	100	100	100
43	Paraguay	100	100	100	100	100
44	Uruguay	100	100	100	100	100
45	Costa Rica	100	100	100	100	100
46	Panama	100	100	100	100	100
47	Honduras	100	100	100	100	100
48	Nicaragua	100	100	100	100	100
49	El Salvador	100	100	100	100	100
50	Jamaica	100	100	100	100	100
51	Trinidad and Tobago	100	100	100	100	100
52	Suriname	100	100	100	100	100
53	Guatemala	100	100	100	100	100
54	Belize	100	100	100	100	100
55	Haiti	100	100	100	100	100
56	Dominican Republic	100	100	100	100	100

MINITAB has pull-down menus for all of its statistical capabilities. Just click and work with your data!



MINITAB Statistical
Software runs
on Windows '95,
Windows 3.1,
Windows NT,
Macintosh and
Power Macintosh.

**To learn more about MINITAB,
visit us on our Web site:
<http://www.minitab.com>**

Minitab Inc., 3081 Enterprise Drive, State College, PA, USA;
In Europe, call +44-(0)1203-695-730; Outside Europe, fax 814-238-4383.

All product names are trademarks of their respective companies.
© Minitab Inc., 1996 MINITAB is a trademark of Minitab Inc.

**To order MINITAB
Statistical Software, call:
800-448-3555 814-238-3280**

microscopic pits that represent binary ones and zeros. On a CD, the minimum length of a pit is 0.834 micron; on a DVD, it's reduced to 0.4 micron. This lets the disc-mastering machinery squeeze the pits more closely together.

In addition, the data track that spirals outward from the center of the disc is spaced only 0.74 micron apart on a DVD; the track pitch on a CD is 1.6 microns. To read these smaller pits and tighter tracks, DVD drives use a red laser at a wavelength of 635 to 650 nanometers; CD-ROM drives use an infrared laser at 780 nanometers. The red-laser diodes in DVD drives are identical to those in bar code readers (see the table "Comparing CD-ROM and DVD-ROM" on page 144).

Reducing both the pit size and the track pitch increases the disc's capacity about sevenfold: 4.7 GB for DVD compared to 682 MB for CD. Mindful of the unquenchable demand for mass storage, however, DVD designers (Philips, Sony, Toshiba, and Matsushita deserve most of the credit) adopted two additional strategies: dual layers and double sides. Each enhancement is optional.

Dual layering is the most impressive technology. All CDs and DVDs have a layer of reflective material (which is usually aluminum) immediately behind the pitted polycarbonate substrate. The reflective layer bounces the laser back to the photodetector. Dual-layer DVDs have a semireflective layer on top of the fully reflective layer, and the lasers in DVD drives can read each layer separately.

This technique almost, but not quite, doubles the capacity of a disc. The lower reflectivity of the second data layer limits it to about 3.8 GB, compared to 4.7 GB in the fully reflective layer. That's why dual layering yields 8.5 GB per side instead of 9.4 GB.

If that's not enough for you, DVDs can also store data on both sides. Double-sided discs have two polycarbonate substrates bonded back-to-back, and each substrate may contain one or two layers of data. It's even possible to bond a single-layer substrate with a dual-layer substrate. Therefore, the total capacity of a double-sided DVD-ROM can range from 9.4 to 17 GB.

Double-sided DVDs have some drawbacks, however. Ordinary disc labels are opaque to lasers, so double-sided discs require a special holographic label that's difficult to see in dim light. Also, double-

DVD Physical Formats		
DVD format	Capacity (120-mm disc)	Capacity (80-mm disc)
DVD-ROM: one side, one layer	4.7 GB	1.4 GB
DVD-ROM: one side, two layers	8.5 GB	2.6 GB
DVD-ROM: two sides, one layer	9.4 GB	2.9 GB
DVD-ROM: two sides, two layers	17 GB	5.3 GB
DVD-R: one side, one layer	3.9 GB*	1.2 GB*
DVD-R: two sides, one layer	7.8 GB*	2.4 GB*
DVD-RAM: one side, one layer	2.6 GB*	0.7 GB*
DVD-RAM: two sides, one layer	5.2 GB*	1.5 GB*

*BYTE estimate; industry standards are not yet finalized.

sided DVDs are more vulnerable to surface damage, because both sides contain data and the substrates are thinner.

Wait, There's More

The options for single- or double-sided discs and single- or dual-layer sides raise the possibility of at least five physical formats—but DVD doesn't stop there. Another variation is DVD-R, expected to debut late next year. This is a write-once format similar to CD-R that replaces the read-only polycarbonate data layer with an organic dye. DVD-R drives can record data by burning spots in the dye. However, due to the limitations of this material, single-layer DVD-R discs will have somewhat less capacity than single-layer DVD-ROMs (about 4 GB compared to 4.7 GB). Also, this material is not as suitable for making dual-layer discs.

DVD-RAM, expected to debut in 1998, encodes the data on a rewritable phase-change material. It will have even less capacity than DVD-R, probably topping out at 2.6 GB per side. According to Arjen Bouwman, DVD marketing director at Philips, DVD-RAM shows more promise for dual layering than DVD-R, but the first DVD-RAMs will almost certainly be single-layered.

The DVD standard also provides for discs that are 80 mm in diameter instead of 120 mm. Although they have about 70 percent less capacity, the smaller discs may find a home in mobile devices. Like their 120-mm cousins, they can be single- or dual-layered, single- or double-sided, and recordable or rewritable.

Just to keep things interesting, the industry is also talking about DVD drives that could read discs at a constant angular velocity (CAV) as well as a constant linear velocity (CLV). Currently, the CD and

DVD standards use CLV to maintain a constant bit rate; rpm gradually increase as the drive reads the inner (shorter) tracks.

In a CAV drive, however, rpm would remain constant, no matter which part of the disc the laser is reading. Throughput would decrease when reading sequential data from the inner tracks, but the trade-off would be faster access times, because the drive wouldn't have to speed up or slow down when it's switching tracks. CAV drives would be better for applications that rely on random access, such as databases.

Yet another possible format is the hybrid CD/DVD. This disc would overlay a semireflective DVD layer on top of the fully reflective CD layer. The shallower DVD layer (0.6 mm) would be effectively transparent to existing CD-ROM drives and CD audio players, whose infrared lasers would focus on the deeper-layered CD data (1.2 mm). Thus, a hybrid disc could work on both types of drives.

Hybrid drives that read both CD and DVD discs are another possibility, though they're not required by the DVD standard. To avoid the cost of two laser diodes (red and infrared), Mitsubishi has designed a mechanism that swings two different lenses into the path of the laser beam, changing its wavelength from 635 to 780 nanometers. Another clever solution, devised by Matsushita, beams the laser through an aspheric molded-glass lens that has a special holographic pattern on its surface. The holographic pattern modifies the laser's wavelength for either CD or DVD by diffracting the beam.

At this writing, it was too early for us to test DVD-ROM drives and discs for multiformat compatibility. This will obviously be an important consideration when choosing a DVD-ROM drive. *continued*

SERIAL PORT ORIGINALS



At Central Data, serial communications is not a side business. It's our only business. This dedication has inspired a collection of "originals" for UNIX® and Windows NT™ not found anywhere else. If we don't have exactly what you need, send us your specs. We specialize in OEM and custom solutions.

Our high-speed scsiTerminal Servers™ and EtherLite™ Port Servers allow you to add from two to hundreds of *real* (not pseudo) serial ports. Without network configuration hassles. And without using any card slots.

Adding modems? Reduce the normal cabling mess with our streamlined SCSI and EtherLite Modem Servers. They connect up to 16 PCMCIA modems in a single box.

If you're looking for PCI boards, try our new 4- and 8-port serial cards. They're our lowest-cost solutions ever.

To fully appreciate our Serial Port Originals, evaluate one FREE for up to 30 days. Call **1-800-482-0397**. Or view our website at <http://www.cd.com/>. See how Central Data has turned UNIX and NT connectivity into a work of art.

Central Data

Email: c-info@cd.com • WWW: <http://www.cd.com/> • 1602 Newton Drive • Champaign, IL 61821-1098 • 217-359-8010 • 800-482-0397 • Fax 217-359-6904

©1996 Central Data Corporation. All rights reserved. Central Data product names are trademarks of Central Data Corporation. Other trademarks are the property of their respective owners.

Circle 167 on Inquiry Card.

Pair Bonding

Why are there so many DVD formats? Blame the industry's long-running battle over DVD. Two alliances tried to unilaterally establish the new standard. One group, led by Sony and Philips, favored a single-sided/dual-layer disc. The other group, led by Toshiba and Time Warner, favored a double-sided disc. To avoid a format war reminiscent of the Beta-versus-VHS debacle of the 1980s, the computer industry worked with Hollywood to reach a compromise. As a result, the DVD standard inevitably bears some marks of a technology that was designed by committee.

For example, if you closely examine a single-sided DVD, you'll notice it has two polycarbonate substrates bonded back-to-back, just like a double-sided DVD. The only difference is that one substrate is a blank dummy.

This happened because the Toshiba/Time Warner alliance insisted on a double-sided option, which requires back-to-back bonding. Each substrate is 0.6 mm thick; after bonding, the total thickness is 1.2 mm. To be compatible, a single-sided DVD must also be 1.2 mm thick. However, it can't use a 1.2-mm substrate, because the laser expects to find the data at a depth of 0.6 mm. Thus, a single-sided disc must have two 0.6-mm substrates, even though only one substrate stores data.

Sony and Philips argued that bonded discs are more expensive to manufacture, and users have to manually flip over a double-sided disc to read the other side. (Conceivably, a DVD drive could have a separate laser for each side, but this would nearly double the cost and complexity of the drive. Moreover, it would make it too bulky to fit in a standard drive bay.) Toshiba and Time Warner argued that disc bonding is a mature technology (it's been done for years with 12-inch video

laserdiscs) and that double-sided DVDs have more capacity. Ultimately, the latter argument won.

Fortunately, one thing that everybody involved agreed on is a standard *logical* format. Up to now, I've been talking about *physical* formats: the methods of physically storing data on the disc. The logical format is the disc's file structure. All DVDs will obey a standard that's called the Universal Disk Format (UDF), which is a subset of the ISO-13346 standard for data interchange.

With UDF, it should be easier to create a single disc that works on multiple OS platforms, including DOS, Windows, Windows NT, OS/2, the Mac OS, and Unix. When these OSes add support for UDF—in the form of a new driver or extension—they will be able to recognize any DVD. UDF essentially abstracts OS-specific features like filename conventions, extended file attributes, byte ordering, and Mac resource forks. Executable programs are still platform-specific, of course, but at least the data is portable.

To help bring developers up to speed on UDF, the Optical Storage Technology Association publishes a technical white paper on its Web site (see the "Where to Find" box).

Just in case some OSes don't immediately support UDF, some early DVD-ROMs may be "bridge discs": They will have

Comparing CD-ROM and DVD-ROM

	CD-ROM	DVD-ROM
Disc diameter	120 mm (4.7 inches)	120 mm ¹
Disc thickness	1.2 mm (0.6 mm × 2)	1.2 mm
Track pitch	1.6 microns	0.74 micron
Minimum pit length	0.834 micron	0.4 micron
Laser wavelength	780–790 nanometers (infrared)	635–650 nanometers (red-laser diode)
Data layers	One	One or two
Data sides	One	One or two
Data capacity (per layer) ²	682 MB	4.7 GB ³
Data capacity (per side) ²	682 MB	4.7 to 8.5 GB
Total data capacity ²	682 MB	17 GB
Reference speed (1×)	1.2 meters per second CLV ⁴	3.49 meters per second CLV ⁵
Reference data rate (1×)	153.6 KBps	1.385 MBps

¹ The DVD standard includes an 80-mm version.

² Read-only. Recordable and rewritable DVD formats have less capacity.

³ Dual-layer DVD-ROMs have a semireflective layer that has less capacity than a fully reflective layer.

⁴ Constant linear velocity.

⁵ Industry groups are also discussing a constant-angular-velocity (CAV) version.

both UDF and ISO-9660 file structures pointing to the same data. (ISO-9660 is the CD-ROM standard.) DVD video players, however, will recognize only a special subset of UDF known as Micro UDF. It's basically the same as full UDF, except the video player looks for files in one particular subdirectory. This lets developers mix video and computer data on one DVD that's playable on either a consumer video deck or a DVD-ROM drive. For example, Disney could release *The Hunchback of Notre Dame* and a computer game based on the movie on a single disc.

With so many possibilities, DVD deserves its nickname digital versatile disc. But its versatility could also be a vulnerability. Can the numerous companies that are pulling DVD in so many directions settle their remaining differences and produce drives that are as versatile as the discs? Achieving full compatibility with all of DVD's physical formats won't be trivial, and most users will want backward compatibility with their CDs, too. That will be the real test.

If vendors can deliver on their promises, DVD seems like a no-brainer for computer users and developers who are eager to make the transition from megabytes to gigabytes. **B**

Tom R. Halfhill is a BYTE senior editor based in San Mateo, California. You can reach him on the Internet at thalfhill@bix.com.

WHERE TO FIND

General DVD Information

<http://www.unik.no/%7Erobert/hifi/dvd/>

Philips DVD

http://www-us.philips.com/pkm/laseroptics/dvd/brochure/index_en.htm

Sony DVD

<http://www.sel.sony.com/SEL/consumer/dvd/>

Toshiba DVD

<http://www.toshiba.com/tacp/SD/>

Universal Disk Format

Optical Storage Technology Association
Santa Barbara, CA

<http://www.osta.org/html/ostatech.html>

FREE PRODUCT INFORMATION

BYTE Advertisers Deliver the Information You Need - FAST!

YES! I want FREE product information from the following advertisers

Fill out this coupon carefully. Please print.

Name First Last

Title

Company

Address

City

State Zip

Phone

Fax

A. My company profile is best described as: (check one)

- 1 ☐ Corporate end user
- 2 ☐ Computer/communications manufacturer
- 3 ☐ Reseller/distributor/OEM/integrator/consultant
- 4 ☐ Other (please describe):

B. My job function is best described as: (check one)

- 5 ☐ Company Management
- 6 ☐ IS/MIS/IT Management
- 7 ☐ Systems Engineering/Integration
- 8 ☐ Departmental Management (non-IS/MIS)
- 9 ☐ Technical Services Support
- 10 ☐ Other (please describe):

C. My responsibilities require that I be involved with the following operating system environments: (check all that apply)

- 11 ☐ DOS
- 12 ☐ OS/2
- 13 ☐ Mac/OS
- 14 ☐ UNIX (any, including Solaris)
- 15 ☐ Windows
- 16 ☐ Windows/NT
- 17 ☐ NetWare
- 18 ☐ Other (please describe):

D. Please indicate which specific fields of interest are important to you: (check all that apply)

- 19 ☐ Mobile Computing
- 20 ☐ Application development
- 21 ☐ Client/Server
- 22 ☐ Internet/on-line
- 23 ☐ Video Conferencing
- 24 ☐ Multimedia
- 25 ☐ PC Telephony

E. Do you influence the purchase of the following products or services for your organization? (check all that apply)

- 26 ☐ Computers/peripherals
- 27 ☐ Software applications
- 28 ☐ Remote/wireless communications
- 29 ☐ LAN hardware or software
- 30 ☐ Internetworking hardware, software, or services

October 1996

90 97 98

Valid until December 31, 1996

Advertiser Inquiry Numbers

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136
137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153
154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187
188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204
205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238
239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272
273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289
290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306
307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323
324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357
358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374
375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391
392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408
409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425
426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442
443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459
460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476
477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493
494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527
528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544
545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561
562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578
579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595
596	597	598	599	600	701	702	703	704	705	706	707	708	709	710	711	712

Editorial Inquiry Numbers

976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992
993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009
1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026
1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043
1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060
1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077
1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094
1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111
1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128
1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145
1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162
1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179
1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196
1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213
1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230
1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247
1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264
1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281

Product Category Information

To receive information for an entire category, circle the appropriate number in box above.

Hardware

- Accessories/Supplies 1
- Add-in Boards 2
- Bar Coding 3
- Communications/Networking 4
- Computer Systems 5
- Data Acquisition 6
- Diagnostic Equipment 53
- Disks & Optical Drives 7
- Diskettes/Duplicators 8
- Fax Boards/Machines 9

Graphics Tablets/Mice/

- Pen Input 10
- Keyboards 11
- LAN Hardware 12
- Laptops & Notebooks 13
- Mail Order 14
- Memory/Chips/Upgrades 15
- Miscellaneous Hardware 16
- Modems/Multiplexors 17
- Monitors & Terminals 18
- Multimedia/CD-ROM 19
- PCMCIA 57
- Printers/Plotters 20
- Programmable Hardware 21
- RAID Drive Arrays 56
- SCSI/Peripheral Interfaces 59
- Scanners/OCR/Digitizers 22
- Security 52

Tape Drives

- UPS/Power Management 23
- Voice Technology 55
- Software 25
- Business 26
- CAD/CAM 27
- Communications/Networking 28
- Data Acquisition 29
- Database 30
- Educational 31
- Engineering/Scientific 32
- Entertainment 33
- Graphics 34
- Macintosh 35
- Mail Order 36
- Mathematical/Statistical 37
- Miscellaneous Software 38

On-Line Services

- Operating Systems 39
- OS/2 54
- Programming Languages/Tools 40
- Security 41
- Shareware 42
- Software Duplication 43
- Spreadsheets 44
- UNIX 45
- Utilities 46
- Windows 47
- Word Processing 48
- General 49
- Books/Publications 50
- Recruitment 51
- Miscellaneous 52

FAST: ▶

QUIRE BY MAIL

Enter your name and address at right. Then circle the inquiry numbers that correspond to those on the advertisement or BYTE article, and mail this attached card.

FASTER:

QUIRE BY FAX

Enter the information as described above, then fax this card to:

16-620-9790

FASTEST:

QUIRE ON

THE INTERNET

Access BYTE's

home page at:

www.byte.com

and click on Free

Product Information.

Follow the

instructions on-line.

BYTE

FREE PRODUCT INFORMATION

BYTE Advertisers Deliver the Information You Need – FAST!

A Division of The McGraw-Hill Companies



BYTE

TNT MAILFAST
FRG/BOS/700252/MO1
P.O. BOX 66
HOUNSLOW
TW5 9RT
ENGLAND

PLACE
POSTAGE
HERE

FAST:

INQUIRE BY MAIL

Enter your name and address at right. Then circle the inquiry numbers that correspond to those on the advertisement or BYTE article, and mail this attached card.

FASTER

INQUIRE BY FAX

Enter the information as described above then fax this card to:

416-620-9799

FASTEST

INQUIRE ON THE INTERNET

Access BYTE's home page at:

www.byte.com

and click on Free Product Information. Follow the instructions on-line.

BYTE

Comparison

Replica and ArcServe take vastly different approaches to meet the network-backup challenge. By Steven J. Vaughan-Nichols

Net Savivors

Somewhere in the fog of your memory, along with 1980s rock bands and single-server networks, you probably remember when you could back up a network onto 250-MB quarter-inch-cartridge (QIC) tapes. Perhaps you even recall the days when you could bring down your NetWare or Windows NT net-

work during the middle of the night for backup. Today, if your storage media can't handle at least a gigabyte per tape, you're wasting time swapping out tapes. As for bringing down the network for backup, fat chance. In today's office, workers are just as likely to be running applications from Hong Kong hotel rooms at 2:00 a.m. local time as they are during business hours. A good enterprise network never goes down.

ARCserve

NetWare Directory Services

- ATL-ND5
- CA-TECH
- DISCOVERY CS
- ELM
- HPP
- SE GLOBAL
- TECHPUB
- ID=TECHPUB
- CN=Admin

RATINGS

TECHNOLOGY	★	★	★	★	★
IMPLEMENTATION	★	★	★	★	★
PERFORMANCE	★	★	★	★	★

work during the middle of the night for backup.

Today, if your storage media can't handle at least a gigabyte per tape, you're wasting time swapping out tapes. As for bringing down the network for backup, fat chance. In today's office, workers are just as likely to be running applications from Hong Kong hotel rooms at 2:00 a.m. local time as they are during business hours. A good enterprise network never goes down.

As you can see, backup is different today, and it needs different software. Heterogeneous networks are the norm, and intranets are taking over the LAN world. With a large LAN, you may very likely have several different servers providing backup services with just as many backup media devices. Thus, you need

backup software that can not only speak different computer dialects but also cope with different tape formats. Last, but far from least, the software must be able to catalog and track them all in a centralized database. If you have a NetWare-based LAN, you need *client agents*—small programs that enable “foreign” systems (running anything from the Mac OS to Unix to Windows 95) to hook up with the backup program.

BYTE has tested a couple of products that satisfy these massive requirements: Cheyenne Software's ArcServe 6.0 and Stac Electronics' Replica 2.1. Both programs are primarily NetWare oriented; however, each is also available in an NT-server version.

These two programs take vastly different approaches to network backup. ArcServe, honed by years of experience, employs a standard file-by-file backup and recovery system, while relative newcomer Replica mirrors entire NetWare volumes. Besides this major difference, there are a number of other small dissimilarities between the programs. Each approach has its advantages for particular situations.

REPLICA

File Operation Window Help

Host Server: JIMF

Source: Network

RATINGS

TECHNOLOGY	★	★	★	★	★
IMPLEMENTATION	★	★	★	★	★
PERFORMANCE	★	★	★	★	★

Cheyenne ArcServe 6.0

ADVANTAGES

- + Fastest file-based backups
- + Multithreaded backup agents
- + Can do RAID 5 backup

DISADVANTAGES

- Expensive

Although ArcServe has been around in some form for nearly as long as NetWare, version 6.0 isn't your father's ArcServe. This new version comes with a host of new features, the most important being what Cheyenne calls Push Agents.

Unlike agents that supply you with data from non-Novell sources, ArcServe's Push Agents manage multiple system-file access. These agents allow multiple data streams, so ArcServe can back up data from multiple servers across the network simultaneously. This, in turn, produces faster throughput. In short, ArcServe works as an honest-to-goodness multitasking, multiprocessing backup system; it's not like the old-fashioned, one-job-at-a-time, batch routine that we all know and hate.

You may wonder whether the existence of multiple Push Agents makes much of a difference when they're all writing to the same storage device. Indeed it does, because ArcServe uses another technique, called *media pooling*, to maximize backup speeds by writing to multiple backup devices at once. The result is the fastest file-to-tape backups we've ever seen.

ArcServe has even more tricks up its sleeve. It can use multiple backup devices as RAID Level 5 devices, so even if you lose one tape out of a backup set, you won't lose any data. RAID 5 takes up more tape space, but it ensures that not one byte of data is lost without ArcServe's noticing it and making the appropriate on-the-fly

repairs. The RAID 5 implementation, a technology that is mainly used with secure servers, raises this program far above the common herd of file-by-file backup programs. If you want utmost reliability, then choose this option.

Stac Replica 2.1

ADVANTAGES

- + Data-mirroring needs fewer tapes
- + Great for mirroring and restoring server volumes
- + Can copy non-DOS data, files, and partitions

DISADVANTAGES

- Network is crippled while program runs
- Better at restoring images than individual files

Replica, on the other hand, roars by ArcServe when it comes to backing up and restoring an entire NetWare volume or directory tree. By mirroring only the data in active file systems, and not simply replicating a disk image sector by sector, Replica leaves older image-backup technology eating its dust. System administrators get a faster system-mirroring solution that needs far fewer tapes.

How fast is Replica? On our 120-MHz Pentium Windows NT server with a Travan TR-4 tape drive, we saw 5 GB per hour go whipping by like mile markers on the highway at 80 mph. And that was with a Travan drive, which doesn't come close to the raw throughput of a digital audio-tape (DAT) or 8-mm tape drive.

Interestingly, although Replica works best at the volume/directory-tree level, it can also copy non-volume-specific information, such as an MS-DOS partition, without a hitch. At a time when you need a scorecard to keep track of which machines are using which file systems, it's a true pleasure to have a backup system that doesn't care whether the file system being used is file allocation table (FAT), High Performance File System (HPFS), NT File System (NTFS), or whatever. Replica instantly recognizes the format.

Stac's Object Replication Technology (ORT) also adds flexibility, enabling you to store entire file systems on other servers, tape drives, or even completely different types of storage devices, such as magneto-optical (MO) drives. Better still, Replica can recognize most available storage options, and it automatically presents them to you as possibilities; you don't

TECH FOCUS BACKUP OPTIONS

Mirror, Mirror, on the Tape ...

Still confused about what Stac's Replica does that's different from what Cheyenne's ArcServe does ... or from what other backup systems do? Here's a quick guide to popular backup options.

File by file: With traditional file-by-file backup, each file is copied as a single, named entity, regardless of whether it's compressed. This approach makes finding individual files quick and easy, but creating thousands of individual files on a tape in the first place can be time consuming. An analogy can be drawn to a word processing file containing many individual words that can be found and copied without any problem.

Disk mirroring: Traditionally, mirroring software makes an exact copy of a disk, sector by sector. This is easy and fast to do on the backup end. But when it comes to restoring a file, it's almost impossible to find any individual item inside that image quickly. In terms of our word processing analogy, this is like sending a fax. Instead of having a document that's easy to search, you end up with one huge image file that's nearly impossible to search automatically. Worse, the document includes large amounts of white space that you have to transmit and navigate around to get to the words you need. Like image backup, it's easy to handle, but it's almost impossible to find anything within it quickly.

Data mirroring: What Stac does with Replica, in effect, is to combine the best elements of both approaches. Replica makes disk images that don't include the time-wasting white space of ordinary mirroring. Getting to an individual file still isn't as fast as when working with a file-by-file copy, but it's far faster than dealing with an ordinary mirror-style backup. And note, too, that when we say "data mirroring," "data" includes application code.

have to fiddle with configuration files to ensure the program knows about the MO drive here or the 8-mm library over there.

Restoring files is almost fun with Replica. With NetWare, for instance, you use the program to see the backup media as a volume, assign it a drive letter, and use the usual file-copy and move commands.

When you combine this feature with Replica's imaging capacity, you can even perform such miracles as restoring a dead NetWare server with just two disaster-recovery floppies and a copy of your backup media. This is distinctly reminiscent of Unix, where you can run the OS straight off the tape if you're desperate.

Which One Is Best?

These programs are intended for two different audiences. If you want to clearly see the granularity of file systems—such as when you're in desperate need of one particular file—then ArcServe is for you. Its file-searching and restore speeds are

great. And its RAID 5 option makes it potentially the safest backup system currently on the planet. Still, you pay a hefty price, both in total backup time and in the \$1995 cost of the software.

If you're more likely to want to back up and restore entire systems, even from the brink of server failure, then Replica is what you want. Its major weakness is that, whether you're backing up or restoring, the program will bring other network activity to its knees. Moreover, the program is simply not in the same ballpark as ArcServe for finding and restoring individual files. Still, with its \$995 price, you may be able to forgive these sins.

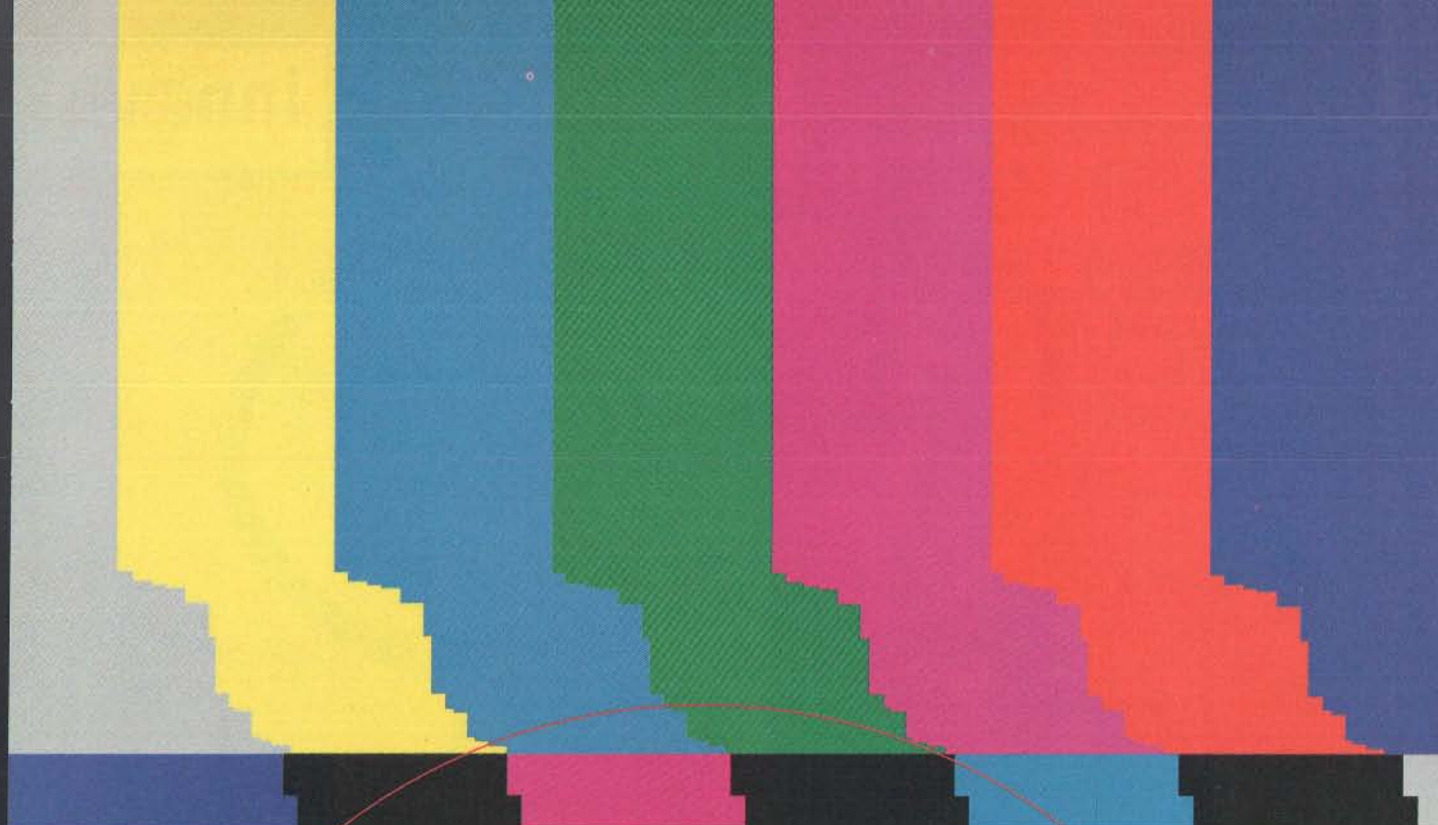
Thus, picking between these two products is both simple and complex; there is no clear editor's choice here. Both are great, but they do somewhat different jobs. You need to analyze your network use carefully to see what your users and your network need most. Only then can you make a reasonable choice between these very different products. But no matter which one you choose, you're going to have a first-rate backup system that should see you through to the end of the century. **B**

Steven J. Vaughan-Nichols is a freelance writer and consultant in Lanham, Maryland. You can reach him at sjvn@vna1.com.

PRODUCT INFORMATION

ArcServe 6.0 \$1995
Cheyenne Software
Roslyn Heights, NY
(800) 243-9462
<http://www.cheyenne.com>
Circle 1047
on Inquiry Card.

Replica 2.1 \$995
Stac Electronics
San Diego, CA
(619) 794-4300
<http://www.stac.com>
Circle 1048
on Inquiry Card.



...This is only a test...this is a test of your ESP storage system...

...If this had been an actual emergency, you would have been notified in advance by audible, visual, Netscape™ GUI and e-mail alarms from your ESP disk, tape or RAID systems...

...ESP, Enterprise Storage Packaging,™ was designed by ANDATACO to proactively manage your storage which prevents system failure and unplanned downtime in your neighborhood...

"B E E E E E E E E E P"

...Integrate Exabyte 8mm technology with ESP, and secure the ultimate in data accessibility, user productivity and peace of mind—knowing you're prepared...

...For official technical information regarding ESP, contact your local account manager at 800-334-9191....This concludes this test of ANDATACO's ESP Storage System...unless you log in now to www.andataco.com to inquire about winning an ESP Storage System.



EXABYTE® 

 **ANDATACO**
Network Storage Solutions

BUSINESS MULTIMEDIA: No, it's not an oxymoron. And Bill Gravinsky, VB and C++ jock, knows it. Bill has redesigned the existing sales automation system to reduce errors and increase productivity of new in-house reps. His charter-develop a friendly GUI, make it easy to update product and customer information over the network-and have it done by Friday.

So Bill's using INNOVUS Multimedia. Cool and useful-that's business multimedia. Question is what are you going to do with it?

innovus

CALL 1.888.301.7728 toll free
FOR A FREE CONTEST KIT & DEMO DISK



What are you going to do with it?

Surf: www.innovusmm.com



Win
\$250
grand

\$250 BIG ONES: Business multimedia is serious business. And it has a serious sound, too: "Cha-ching."

That's right-because if you build a cool business app with INNOVUS Multimedia, you could win any or all of five \$50,000 cash awards.

So if you're a yo-yo freak like Bill Gravinsky, you could amass the world's largest yo-yo collection.

Wacky, yes, but he **is** building a killer app.

Do the same, and the cash could be yours, instead of his. Question is, what are you going to do with it?

Siemens Nixdorf's ComUnity aims to turn Visual Basic 4.0 into a client/server environment but falls short. By Volker Weber and Hans-Jochen Schmitt

Enterprise Visual Basic? Almost...

Although Microsoft markets the Enterprise Edition of Visual Basic 4.0 (VB 4) as an enterprise-level client/server tool, the product still lacks the high-level business-logic tools of such client/server mainstays as PowerBuilder.

Now, along comes Siemens Nixdorf, the German computer company, with a major effort to provide an overarching framework for client/server development that exploits VB 4's open programmable objects. Called ComUnity, the framework prescribes how to build distributed client/server applications. The related development environment is called the Open Technology (OT) Framework, which in its first incarnation works with VB 4. Siemens Nixdorf plans to port it to other languages, including C++. Our examination of a beta version revealed an ambitious product that nonetheless falls well short of its goals.

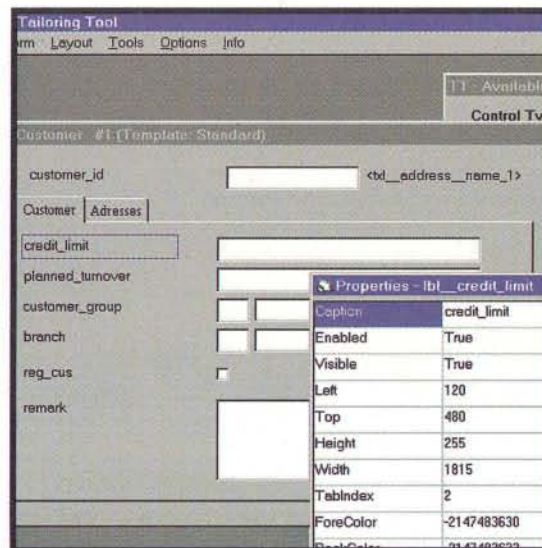
Members of the ComUnity

ComUnity consists of a three-layer application model that comprises a Presentation Layer, a Business Logic Layer, and a Database Layer (see the Tech Focus figure on page 150). This model, like other three-tier architectures, offers advantages in scalability, usability, maintenance, and performance compared to monolithic applications. You can distribute the layers across a network, with the Presentation Layer on users' desktop com-

RATINGS				
TECHNOLOGY	★	★	★	★
IMPLEMENTATION	★	★	★	

puters, the Business Logic Layer on an applications server, and the Database Layer on a database server.

To implement ComUnity's architecture in VB, Siemens Nixdorf had to employ Microsoft's standard development



ComUnity OT Framework
\$1000 per seat (quantity discount available)

Siemens Nixdorf
Information Systems, Inc.
Burlington, MA
(800) 225-1484

Circle 983
on Inquiry Card.

Siemens Nixdorf
Informationssysteme AG
Munich, Germany

Circle 984
on Inquiry Card.

ComUnity OT Framework's Tailoring Tool lets users modify a custom application's UI.

tools, including VB 4 itself, Microsoft Visual C++ 2.2, and OLE components. But because these tools are best suited for small-scale software projects, Siemens Nixdorf added more tools to improve support for large projects.

Inside the OT Framework

Central to OT Framework's Database Layer is a relational data dictionary that serves as a central repository where all the tables, attributes, and relations are managed. From the data dictionary, OT Framework generates Open Database Connectivity (ODBC) data sources, migrates databases, generates SQL statements for data access, and even produces simple entry forms for the user interface.

Unfortunately, even though you can manage the data dictionary with a simple data-entry and maintenance tool, OT Framework provides no graphical representation of the data-dictionary information. It does, however, import data

models produced with CASE tools, such as Microtool's CASE 4.0 and IBM's Mood.

The data dictionary becomes part of the run-time environment repository that's distributed with OT Framework applications. Because the data dictionary contains information on the relationships between tables, applications can provide for relational integrity even if the underlying database has no such provisions.

The Presentation Layer, which establishes the user interface (UI), is built around VB 4. A forms generator uses the data-dictionary information to generate default VB 4.0 data-entry forms. You can customize these forms, but they also work with real data right out of the box.

OLE Automation acts as the glue between the Presentation Layer UI and the Business Layer. Perl scripts link code and single UI controls, but the program generates them automatically, so users don't have to deal directly with Perl. A cross-checker monitors the UI forms against

TECH FOCUS

ARCHITECTURE

Linking Tiers with Remote OLE

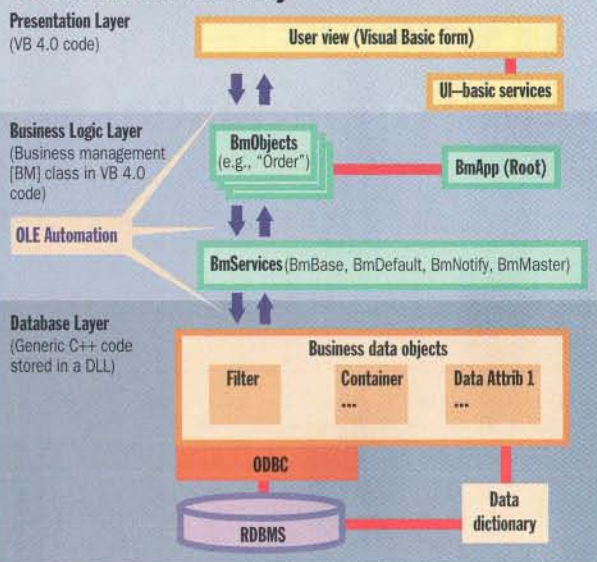
Divide et impera (divide and rule)—splitting applications into three parts—is the state of the art in client/server technology. Modern client/server applications, such as SAP's R/3, use a Presentation Layer (for realizing the user interface) and a Database Layer (for storing persistent data), which are held together by a Business Logic Layer. For performance or maintenance reasons, the different layers can be implemented on distributed systems in a network.

To a programmer, the problem is not whether to split the application, but to choose a distribution technology that allows the parts to communicate over a wide range of networks and OSes. Remote procedure calls (RPCs), Common Object Request Broker Architecture (CORBA), and IBM's Distributed System Object Model (DSOM) are possible solutions. With Visual Basic 4.0 (VB 4) Professional Edition, Microsoft has offered yet another option: Remote OLE.

Remote OLE allows OLE servers and clients to be distributed over a Windows-based network. Instead of invoking OLE server methods on a local machine, the OLE client sends OLE requests over the network to a remote OLE server. Siemens Nixdorf chose Microsoft's Remote OLE as the primary communications technology for distributed, three-tier, client/server applications. Therefore, applications built with ComUnity OT Framework are implemented as VB 4 OLE servers, and thus they can be distributed fairly easily via Remote OLE.

The only catch to this elegant Remote OLE solution is its incompatibility with non-Windows environments.

Three Tiers for ComUnity



Implementing ComUnity applications as OLE servers lets them communicate over a network.

any modifications in the data dictionary.

The forms are stored in the run-time repository, and you can use OT Framework tools to further customize the UI by working on the forms data. Users can use the Tailoring Tool (see the screen on page 149) to customize the UI: data-entry fields can be switched off, changed, or moved, even in the delivered version of an application. Developers who are skittish about giving users this much control over the UI can turn the tailoring tool off. Regardless of whether a site contains some highly individualized UIs, centralized program updates can merge with them seamlessly.

Putting It All Together

As the Tech Focus figure indicates, the glue between the UI and the database is the Business Logic Layer. OT Framework implements this layer in VB 4 code using the new VB 4 class concept. This pseudo-object-oriented feature allows you to define reusable classes and instances, but it doesn't support inheritance or polymorphism. OT Framework comes with predefined classes for UI handling and general-purpose business applications, such as order entry.

The application framework itself is a template-based VB data dictionary called

Code Wizards. Regrettably, except for a run-time debugger, there are no tools in the Business Logic Layer—you're on your own as far as business processes are concerned. Thus, any higher-level knowledge must go from paper directly into VB code.

An Incomplete Toolkit

If you're not familiar with the VB environment, ODBC data sources, or tool-based software development environments in general, installing ComUnity can be a bit daunting. The beta version of the setup routine had some rough edges; the ODBC data sources for the data dictionary and the target applications are not added automatically. You must also add the VB Code Wizards and Form Wizards manually to the VB environment.

From a lone developer's point of view, OT Framework's major advantage is its vast library of reusable VB code for business applications software. The tool is rather loosely integrated with the VB environment. For small-scale projects, it does not go much beyond VB 4 or other add-ins and components that are on the market.

ComUnity also lacks an integrated version-control and project management tool. It relies on Microsoft Visual Source

Safe, which comes bundled with the VB 4 Professional Edition, for version control. But Siemens Nixdorf says it's working to integrate Microsoft Project into a future version of ComUnity OT Framework.

Missing from this first implementation of the ComUnity architecture are integrated Upper-CASE tools, such as data modelers and object-oriented modeling tools. Sinking the whole business logic into pure VB code is asking for trouble, especially if users ask for changes in the application.

As long as you equate cross-platform development with Windows 95 and NT on Intel platforms, you'll have no problems with OT Framework. Its VB-centric approach restricts you to those platforms.

In the final analysis, ComUnity OT Framework caters to very specific needs. If you're a VB developer building large-scale business applications and are willing to learn a new application framework, give version 1.0 of ComUnity OT Framework a closer look. Everyone else should take a pass on it for now. **B**

Volker Weber and Hans-Jochen Schmitt are principals at ifos, a consulting firm in Darmstadt, Germany. They can be reached at 100120.577@compuserve.com.

EXPLORING...

EXPLORING CHEMISTRY FOR WINDOWS

EXPLORING CHEMISTRY contains a large number of topics, which include: the laws of chemistry; Lavoisier, Dalton and Proust; the weighted balance of chemical reactions; matter; pure substances and mixtures; elements and compounds; atoms and molecules; atomic models; the orbital quantum model and chemical bonds. It is also possible to select the elements on the basis of their chemical and physical properties and to make a comparison of the data for several different elements by creating a graph.

The EXPLORING series is a multi-media collection for Secondary School students, designed specifically to help them learn in a simple and intuitive manner. It is not intended solely for students but also for anyone wanting to increase and broaden their knowledge of a specific subject. The user can learn all the information either by following the topics step by step or by navigating through the contents. Learning is pleasant and the results are guaranteed thanks to particularly sophisticated multi-media techniques, such as the use of graphics for a more effective understanding of the contents, hypertext links for moving from a given topic to other related ones and helpful functions for searching for the best-known terms.

EXPLORING PHYSICS FOR WINDOWS

EXPLORING PHYSICS is split up into several learning units covering the main topics of physics: the measurement of physical magnitudes; units of measurement; the analysis of experimental data; from the analysis of data to physical laws; speed, acceleration and force; equilibrium in stiff bodies and fluids; energy, temperature and heat; and electricity and the related phenomena.

EXPLORING MATHEMATICS FOR WINDOWS

EXPLORING MATHEMATICS covers a range of many different topics: sets and their relationships, classes of equivalence, real and non-real numbers, operations and properties, algebraic expressions, monomials and polynomials, logical operations, equations and disequations, systems of equations and disequations and their performance, 1st and 2nd degree equations, radicals, parametric equations and biquadratic equations.

only
\$ 39
each title

Minimum configuration: 100% MS-DOS compatible PC, CPU 80386 or higher, 4 Mb of RAM (8 Mb are recommended), hard disk with 6 Mb of available space, mouse, VGA graphic card or higher, Windows 3.1 or higher. Recommended: Windows compatible audio card, Windows compatible printer.

Available in English, German, Spanish and Italian

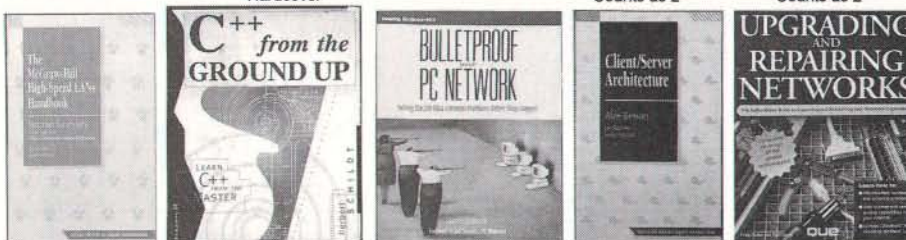
MS-DOS and WINDOWS are registered trademarks of Microsoft Corporation.



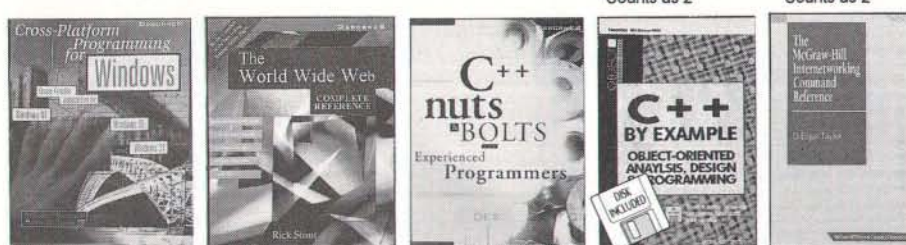
9122493-XX \$49.95 Counts as 2 5874415-XX \$39.99 Counts as 2 0305617 \$55.00 Hardcover 9120989-XX \$70.00 Counts as 2/Hardcover 8820502 \$27.95



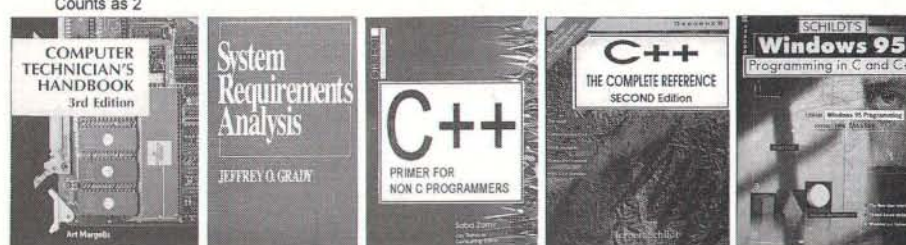
8820901 \$27.95 0464618 \$49.50 Hardcover 8821746 \$29.95 8819512-XX \$34.95 Counts as 2 5871114-XX \$44.95 Counts as 2



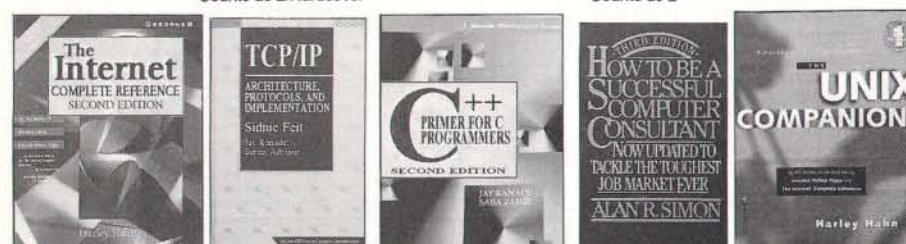
0571996 \$60.00 8819695 \$27.95 0676208 \$34.95 0050767-XX \$50.00 Counts as 2 5872757-XX \$49.99 Counts as 2



8821770-XX \$39.95 Counts as 2 8821428 \$29.95 8821401 \$24.95 9119549 \$39.95 0633010 \$60.00



1575472 \$27.95 0239940-XX \$59.95 Counts as 2/Hardcover 072704X \$34.95 8821231-XX \$34.95 Counts as 2 8820812 \$29.95



882138X \$32.95 0203466-XX \$45.00 Counts as 2/Hardcover 0514879 \$34.95 0576173 \$30.00 Hardcover 8821495-XX \$29.95 Counts as 2

If card is missing, write to: **Computer Professionals' Book Society**, A Division of The McGraw-Hill Companies, P.O. Box 549, Blacklick, OH 43004-9918

PHONE: 1-614-759-3666 (8:30 a.m. to 5:00 p.m. EST Monday-Friday)

FAX: 1-614-759-3749 (24 hours a day, 7 days a week)

THE EASY, RELIABLE WAY TO SATISFY YOUR PROFESSIONAL NEEDS

4 BOOKS FOR ONLY \$4.95

plus 1 book **FREE** upon prepayment when you join **Computer Professionals' Book Society**

Values up to **\$264.45**

As a member of the **Computer Professionals' Book Society**...you'll enjoy receiving Society bulletins every 3-4 weeks containing exciting offers on the latest books in the field at savings of up to 50% off the regular publishers' prices. If you want the Main selection, do nothing and it will be shipped automatically. If you want another book, or no book at all, simply return the reply form to us by the date specified. You'll have at least 10 days to decide. If you ever receive a book you don't want due to late delivery of the bulletin, you can return it at our expense. And you'll be eligible for **FREE BOOKS** through the Bonus Book Program. Your only obligation is to purchase 3 more books during the next 2 years, after which you may cancel your membership at any time.

All books are softcover unless otherwise noted. Publishers' prices shown. If you select a book that counts as 2 choices, write the book number in one box and XX in the next. A shipping/handling charge & sales tax will be added to all orders. ©1996 CPBS

BYP1096

Powersoft's Optima++ makes C++ client/server development a drag-and-drop dream. By Rick Grehan

A C++ Tool That Cures VB Envy

In spite of all the complaints about Visual Basic (it's slow, it's only somewhat object-oriented), you have to love how easy it makes building user interfaces (UIs). Wouldn't you like to have the same building-block-style environment in a C++ package?

Powersoft's Optima++ is about as close as you'll get... for now. It is a rapid application development (RAD) system for Windows 95 and NT that incorporates the best of current Windows development systems. Look at who's contributed genetic material to its conception: Watcom, producer of one of the best C/C++ compilers for Intel platforms; Sybase, a database organization of considerable repute; and Powersoft, creator of the PowerBuilder fourth-generation language (4GL) development system. The result is a combination UI builder, client/

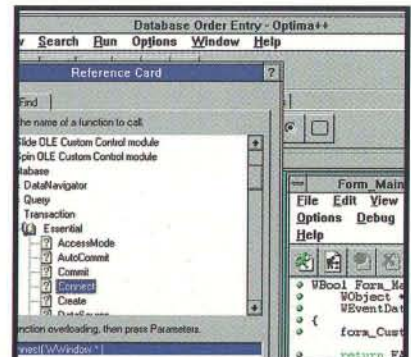
of souped-up hierarchical help system structured in outline form. The upper-level branches of the outline consist of the object categories understood by Optima++: database objects, graphics objects, menu objects, and so forth. The leaves are the object methods.

The reference card is much more than a static help mechanism. For example, associated with any visual object (say, a button) on a form is source code for handling events that the object receives. Open a window to that source code, grab any other visual object (say, a listbox), and drag that object into the source code window. This will cause Optima++ to open the reference card, properly positioned to the methods associated with that listbox. With just a few more mouse-clicks, Optima++ will automatically write the source to invoke the selected method for you.

Components and C++

Drag-and-drop programming is only part of Optima++'s allure. Because it uses a construction-by-components paradigm, you'll find nonvisual components as well as visual ones (e.g., database query components and transaction components). Optima++ can also incorporate OLE Controls (OCXes) into its component toolbars, which means it also creates entries in the reference card for each OCX. Consequently, you manipulate OCXes in the same way as the native components supplied with Optima++.

Finally, because Optima++ is, after all, a C++ development system, it wraps a number of system services in easy-to-handle classes (e.g., thread objects). Its debugger is as full-featured as any I've seen, going so far as to include a memory tracker, which can locate a number of memory-related bugs. The memory tracker's coverage ranges from simple leaks to more elaborate validity checks



Optima++

\$199

Developer Edition

Powersoft Corp., Concord, MA
(800) 395-3525 or (508) 287-1500

fax: (508) 369-4695

<http://www.powersoft.com>

Circle 985 on Inquiry Card.

Just Up the Road

Soon-to-be-released editions of Optima++ will include:

- Sybase SQL Anywhere (four-user version)
- Internet components
- Integrated support for Java
- Team programming
- Native database drivers

server database construction kit, and general-purpose C/C++ compiler that will probably have Delphi and VB developers sneaking peeks over the shoulders of Optima++ users.

Cultured Drag and Drop

Optima++'s most elegant feature is without doubt its drag-and-drop programming. The designers have turned on-line help into a *reference card*, a kind

of objects such as strings and Graphical Device Interface (GDI) handles.

What's Ahead

At the time of this writing, only Optima++'s Developer Edition was in re-

RATINGS				
TECHNOLOGY	★	★	★	★
IMPLEMENTATION	★	★	★	★

lease. Professional and Enterprise Editions will appear soon (see the text box "Just Up the Road"). If the upcoming editions are as well done as the Developer Edition, they could well be the stepladders that many VB developers need to begin their ascent to the otherwise frightful altitudes of C++ programming. **B**

Rick Grehan is senior technical editor of BYTE reviews. You can reach him on the Internet at rick_g@bix.com.

With Compaq's Armada 4100 family, you build the notebook you need. By Dave Rowell

Notebook Under Construction

I love Compaq's new Armada 4100 notebooks for many reasons, but particularly for their configurability. Compaq has taken the concept behind Digital Equipment's HiNote Ultra II notebooks and run with it.

The standard 6-pound, 1.5-inch-thick configuration has an internal floppy drive, but the battery is in the sturdy handle, which can prop up the rear 10 degrees or fold up to protect the I/O ports in transit. Remove the handle and replace the modular floppy drive with a \$199 battery module, and you have a 5-pound slim-line notebook. Two screws with D-ring loops make the handle attachment easy and secure.

Going the other way, you can attach the optional \$399 CD-ROM base and have an 8.2-pound multimedia notebook. The base holds a 4× CD-ROM drive, two more (larger) stereo speakers, and a bay for another battery. Remove the floppy

alloy frame gives it strength and conducts heat from the processor. Compared to Compaq's larger LTE 5000 series, the Armada 4100 notebooks lack the option of a full docking station with drive bays. They can, however, attach to a port-replication base (with or without the CD expansion unit) that has an Ethernet port.

Pricing is competitive, starting at \$2599. I tested the high-end Armada 4130T, which costs \$4599 and includes a 133-MHz Pentium, 16 MB of RAM on the system board, an 11.8-inch active-matrix color display, and a 1.08-MB hard drive (the current maximum). With the CD-ROM expansion base and an extra battery, I was up to \$5197. You can add up to 32 MB of additional RAM using two dual in-line memory module (DIMM) sockets. All models come with 256 KB of 9-nanosecond static RAM (SRAM) cache, a PCI bus, full video and audio ports, speakers and a microphone, an infrared port, and zoomed-video-enabled PC Card slots.

Displays are upgradable. Compaq designed the 4130T's 11.8-inch, 800- by 600-pixel active-matrix color display with a limited horizontal viewing angle, which is better for plane flights than conference rooms. Less expensive models can have 10.4- or 11.3-inch dual-scan displays. You get your choice of pointing devices. Armada 4100 notebooks come standard with a Cirque-type touchpad, but you can order it with a trackball and swap out one for the other.

The four programmable keys along the top left of the keyboard are surprisingly useful. A Compaq extension to the keyboard control panel lets you assign a program to each key, choosing from a list of all runnable programs. You can press a key to launch Explorer, for example.

Compaq adds some nice touches to the Windows 95 environment. A slick power management control panel offers

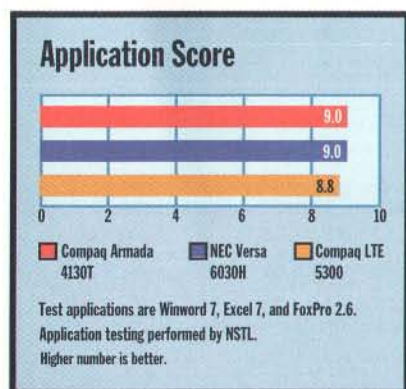


Armada 4130T
\$5197

(estimated street price with a mobile CD base with an extra battery)

Compaq Computer Corp.
Houston, TX, (800) 345-1518 or
(713) 370-0670; fax: (713) 514-1740
<http://www.compaq.com>

Circle 1060 on Inquiry Card.



drive, and the notebook can hold three lithium-ion batteries for a really long flight.

In any configuration, an Armada 4100 is bulkier than a HiNote Ultra II, but it's also more functional, holding floppy and CD-ROM drives simultaneously, for example. The Armada's magnesium-

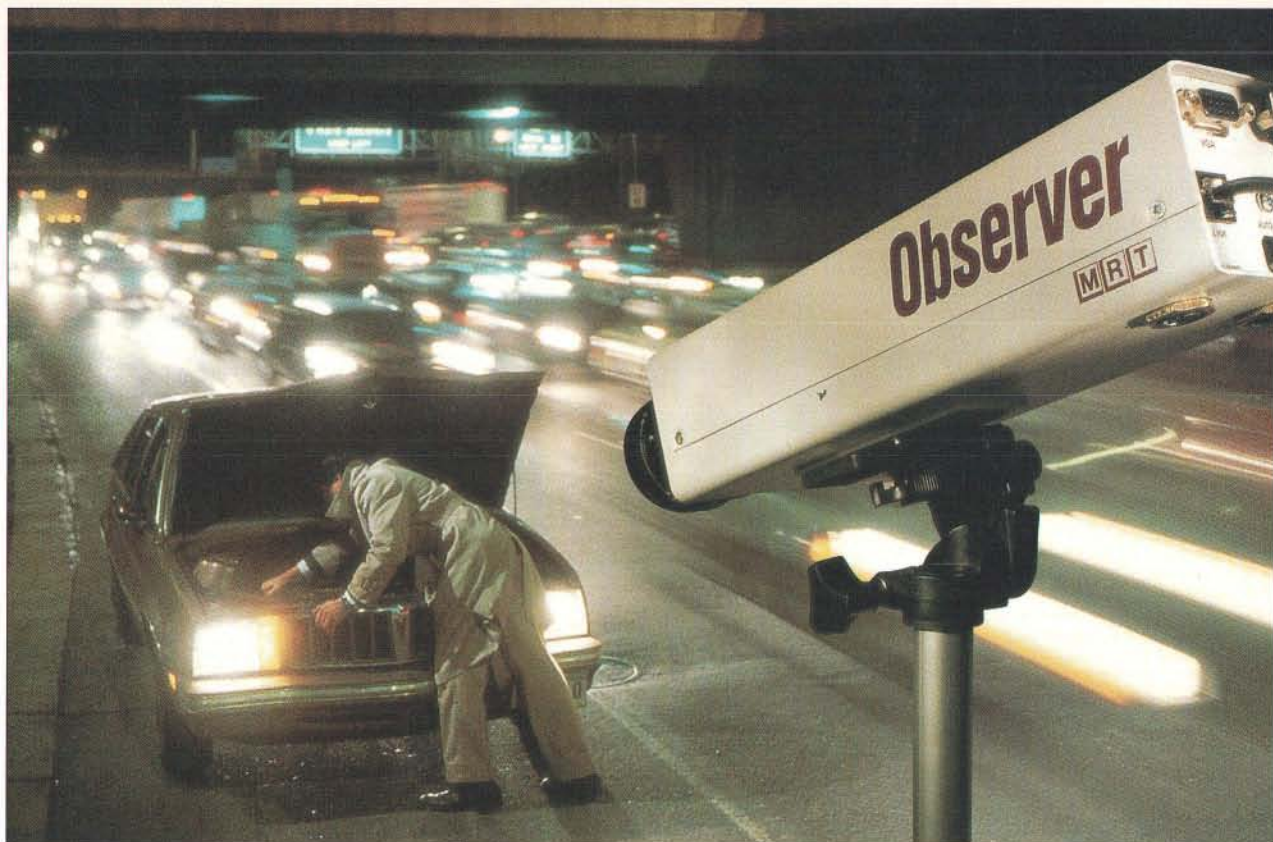
many sensible options, like AC power management, that are easy to figure out and modify. Compaq's diagnostics program tells you more things about your computer than you'll ever want to know.

In performance, the Armada 4130T ties the NEC Versa 6030H, the performance winner in this month's NSTL

RATINGS				
TECHNOLOGY	★	★	★	★
IMPLEMENTATION	★	★	★	★
PERFORMANCE	★	★	★	★

Hardware Lab Report (see page 114). In design, Compaq has really hit a sweet spot. I expect the Armada to be both admired and copied. **B**

Dave Rowell is a BYTE senior technical editor who handles hardware reviews. You can reach him at drowell@bix.com.



Call the Observer and get the Picture

What's going on? What is the traffic like today? The Observer can provide instant answers for professionals in any business. Whether you work for the road traffic administration, a security company, the police, or are just an ordinary commuter, you can get a bird's eye view of any situation. Simply call the Observer from your laptop or desktop PC, or arrange for the Observer to call you.

The Observer - your intelligent eye

The Observer offers a wide range of practical applications for security companies, banks, post offices, railroads etc. Perhaps the Observer is exactly what you've been waiting for to give your WWW site a visual dimension? The number of applications is limited only by your imagination. Remember: The Observer is a tiny computer built into a camera, offering an extremely versatile combination.

This is the Observer

The MRT Observer consists of: A video camera (monochrome or full color), a 486 PC with 8 MB RAM and a Hard Disk. The entire system is miniaturized: H: 55 mm x W: 73 mm x L: 250 mm. The Observer is 100% PC compatible and can be supplied with Windows, DOS pre-installed. And for communication, you can choose from the open market and install ISDN, GSM, modem or network PC card (PCMCIA) type I or II.

Windows and DOS are registered trademarks of Microsoft Corporation



MRT micro as. Strømsvn. 74 N-2010 Strømmen,
Norway Tel.: +47 63 89 63 00 Fax: +47 63 89 63 01
USA Tel.: +1 303 793 3660 Fax: +1 303 793 3061
Germany Tel.: +49 8092 880 77 Fax: +49 8092 880 76

NOW

**3 PCs can share
Internet access at
the same time with:**

One modem
One telephone line
One IP address



See Us At

COMDEX Fall '96

Booth# S8741

Call for your nearest distributor

1-800-363-8156 Ext. 245

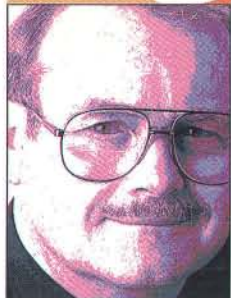
Web: <http://www.protec.ca>

Tel: (514) 630-5832, Fax: (514) 630-2987, E-mail: sales@protec.ca

PROTEC
MICROSYSTEMS INC.

Circle 223 on Inquiry Card.

Chaos Manor



Of Zip and Spam and NT 4.0

Jerry finds new uses for removable drives—once he gets SCSI drive assignments under control.

The worst prediction I ever made was that using spinning metal for mass storage would go away. "Silicon is cheaper than iron," I said. That hasn't happened. Mass storage, like memory, has become so cheap that anyone who loses work because it wasn't backed up deserves what happened.

You can add mass storage by getting a big hard drive and adding it to your system. That's worth doing, but there's an easier way.

The Iomega parallel Zip drive has become something between a standard and a necessity. Attach it to the parallel port of any PC, run one "guest" program from a floppy disk or your hard disk, and you have a 100-MB removable-cartridge drive to use for backup and file transfer. It's extremely well behaved, attaching itself as the next unused drive letter, and it leaves no residual problems when you disconnect it.

The last time I talked about the parallel Zip drive, I casually said "alas, no Mac." Since a Mac has no parallel port, that seemed obvious enough. I have since got a ton of e-mail, some polite, reminding me that the SCSI version of Iomega's Zip drive works just fine with Macs.

Some of the mail was nasty. I know a columnist who swears he will never again mention Macs because he's weary of the hate mail he gets whenever he writes anything but fulsome praise about the Mac. Although I guess I have a bit thicker skin, really, people, you do your cause no good this way. Save your hate mail for your enemies, or better yet, for archiving before you send it.

Anyway, I have a SCSI Zip drive, and, indeed, it works with Macs. With System 7.5's PC Exchange (or a similar utility),

the Mac can read DOS-formatted Iomega disks, so you can use the Zip drive as a convenient sneakernet with backup for transferring data files between Macs and PCs.

The SCSI drive is a lot faster than the parallel drive. It took 6 minutes to transfer 44 MB (some big files, lots of small ones, a complex subdirectory structure) from a hard drive to the parallel Zip drive; doing the same operation with the SCSI Zip drive took just under 2 minutes. Writing that 44-MB directory from the parallel Zip drive to a hard drive took about 5 minutes, as opposed to about 1½ minutes with the SCSI Zip drive. If you're after speed, or you want to transfer

make the external port active and keep a Granite Digital SCSIVue Active Diagnostic Terminator on the port when no other device is attached, so I don't have to go inside Pentafluge to install a SCSI string.

It would have been a lot simpler if I'd had the right cable; alas, the SCSI output on Pentafluge's controller is a standard 50-pin SCSI-2 connector, while the Zip drive wants a DB-25 cable. The cable that comes with the SCSI Zip drive is a male-to-male DB-25 that looks exactly like a heavy-duty parallel-port cable.

Of course, the potential for accidentally plugging the SCSI Zip drive into a parallel port, or the parallel Zip drive into

Anyone who loses work because it wasn't backed up deserves what happened.

from a PC to a Mac and back, clearly you'll want the SCSI version. On the other hand, if what you want is backup and convenient file transfer among PCs, the parallel version is preferable.

The SCSI Zip drive will run off any standard SCSI controller, or you can buy Iomega's SCSI controller card, which appears to be a standard Adaptec SCSI-1 card. Installation for using it with the Zip drive is well documented. My advice is to get an Adaptec SCSI-2 card, but the Iomega card will certainly work. Installation of a SCSI card is simple provided you have a free interrupt request (IRQ). DOS-only systems don't need an IRQ.

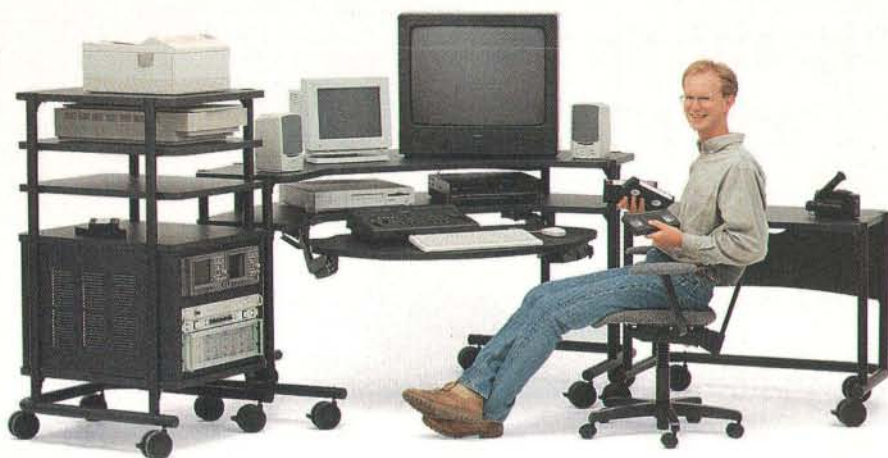
For my first test, I connected the SCSI Zip drive to the SCSI outlet of the Distributed Processing Technology caching drive controller on Pentafluge, the Pentium 60 system we built a couple of years ago. This is an older controller that requires a jumper setting to activate the external SCSI port. I long ago set it to

a SCSI port, is pretty high. I don't know what would happen, but I sure wouldn't want to try it.

Pournelle's first law of making SCSI work: start with Granite Digital SCSIVue Gold Diagnostic Cables and don't change to anything else until you have everything working properly. Granite Digital makes the High Density MicroD 50/DB-25 Cable, a SCSI-2-to-DB-25 cable, but I didn't have one and didn't want to wait. Thus, I connected the Pioneer DRM-624X six-disc CD-ROM changer to Pentafluge with one Granite Digital cable and used a Granite Digital 50 Centronics/DB-25 Cable to daisy chain the SCSI Zip drive to that. The SCSI Zip drive has a switch on the back to set termination: it was the last drive in the SCSI string, so I set it to "on."

The Zip drive also has a switch that sets it as SCSI ID 5 or 6; I set it to 6. Then I brought up the system with no cartridge in the drive and with the DRM-624X turned off and thus inactive. *continued*

AnthroCarts!®



AnthroCarts are so flexible. You have dozens of shapes and sizes to choose, plus over 50 accessories to configure your cart exactly the way you want.

And they have a Lifetime Warranty! Made of steel and high density particle board, these AnthroCarts are as tough as nails.



See them all in our catalog, then call us direct to order. We'll ship to you the very next business day!



Call for your
free catalog:

800-325-3841

6:00 AM to 6:00 PM PST, M-F



Anthro Corporation®
Technology Furniture®
10450 SW Manhasset Dr.
Tualatin, OR 97062
Fax: 800-325-0045
<http://www.anthro.com>

Since 1984. Prices from \$299. For a lower cost line for the home, ask for our SOHO catalog. GSA contract. Available for OEM applications. Anthro, AnthroCart and Technology Furniture are registered trademarks of Anthro.

Windows 95 (Win 95) came up fine, ignoring the DRM-624X as it should. There was one hitch. Pentafluge has logical hard drives C and D, a Maxoptix T3-1300 optical drive as E, and the CD-ROM drive as F. The SCSI Zip drive had taken over the F slot, moving the CD-ROM drive to G. I described a similar experience with the Syquest EZ135 SCSI hard drive in the June column. I got quite a bit of e-mail from people telling me, with various degrees of politeness, that SCSI drives take over in the order of their SCSI ID number, so I'd hoped that setting the SCSI Zip drive to ID 6 would prevent that shift. Alas, that turned out not to be the case.

Once I had the SCSI Zip drive operating, I timed some massive file transfers across the network and then shut down the system.

I got the "Please Wait" message. After about 5 minutes, it was pretty obvious that nothing else would happen, so I cut the main power. When I turned it back on,

The system came up on the third try, and Lo!, the drives were really out of order.

Pentafluge trundled for a while and then Win 95 announced there were problems with the Registry. It offered to restore the Registry from backup and try again, warning me that I might lose something in the process. There didn't seem to be much of an alternative, so I told it to go ahead.

I got the same message once more, and once more told it to go ahead. Recall that the first time I brought up the SCSI Zip drive, I did so with no cartridge in the drive. I had forgotten that, and there was a cartridge in the drive this time.

The system came up on the third try, and Lo!, the drives were really out of order. The D drive, which is merely a logical partition of a single physical drive, had been moved and the SCSI Zip drive had taken over D. E was still the Maxoptix T3-1300, F was now the D drive, and the CD-ROM drive that normally lives at F was now G. All those drives worked in the sense that I could access them, but any software that expected the D drive to be D was hosed.

Shut down once more. This time, it shut down with no problem, and I have been unable to duplicate the shutdown problem on any machine since that first time. I've no idea what happened. Anyway, I removed the cartridge from the SCSI Zip

ROSS

SPARCplug™

Cross-Platform Technology: The Best of Both Worlds.

ROSS Technology announces SPARCplug, a high-performance workstation that fits into the full bay slot of a tower PC. SPARCplug offers better-than-SPARCstation™ 20 performance, with single or dual hyperSPARC processors, up to 256 MB RAM and a SBus slot for options like a T1 line, T3 Line, ISDN or 100-base T Ethernet.

ROSS is a leader in SPARC™ multiprocessing design and technology, so you know SPARCplug is fully compliant with SPARC-based hardware and supports all 10,000-plus SPARC applications.

Infinite possibilities. Ways to use SPARCplug are as varied as your needs. Some of the possibilities include:

- **Intranet and Internet Server:** SPARCplug lets you combine a stable and robust Unix server with a Windows™-based PC client, all in one unit. When combined with Netscape's FastTrack™ or SuiteSpot™ applications, SPARCplug can become the center of your client/server workgroup environment. SPARCplug comes bundled with your choice of SuiteSpot server applications, which can include Netscape Enterprise Server,™ Proxy Server™ and Mail Server.™ SPARCplug provides a true multi-tasking, multi-user environment for fast, easy and safe access to the net.
- **Engineering Workstation:** SPARCplug gives you powerful processing for engineering projects while also allowing you access to the PC enterprise working environment. It saves space and cost.

Call ROSS today at 1-800-774-ROSS to find out more about the amazing SPARCplug!

ROSS
TECHNOLOGY, INC.
THE SPARC SOLUTIONS COMPANY

512-349-3108 (Global) • (512) 349-3101 (Fax)
<http://www.ross.com>

insert
Workstation
here!



©1996 ROSS Technology Inc. All rights reserved. All SPARC trademarks are registered or trademarks of SPARC International, Inc. hyperSPARC is licensed exclusively to ROSS Technology, Inc. SPARCstation is licensed exclusively to Sun Microsystems, Inc. Products bearing SPARC trademarks are based upon an architecture developed by Sun Microsystems, Inc. SuiteSpot, FastTrack, Enterprise Server, Proxy Server and Mail Server are licensed exclusively to Netscape Communications Company. All other product or service names mentioned herein are trademarks of their respective owners.

Circle 155 on Inquiry Card (RESELLERS: 156)

drive and fired up once more. It came up fine. The D drive was once again D.

Of course, the Zip drive had shoved the CD-ROM drive aside and taken over F in its usual high-handed fashion, but otherwise I had no problems. This time it shut down properly, and from that moment on, I have had no problems other than the displacement of the F CD-ROM drive.

The moral of this story is that SCSI has a mind of its own, and if you intend to use a SCSI Zip drive, plan your drive-lettering scheme accordingly. Do not imagine that you can have a CD-ROM drive with a

lower drive letter than the SCSI Zip drive; and if you plan to boot up your system with a cartridge in the drive, be prepared for some other oddities in drive lettering.

You will, however, have a perfectly good drive. You can even boot from it, which means that you can have a series of OSes on different Zip cartridges and boot the one you like. I've tested it with Win 95 and Windows 3.11. I haven't yet tried it with Unix, Windows NT, or any flavor of OS/2, and I probably won't; but I'm told it will work just fine with those, too, since you can set up your computer to believe that

the SCSI Zip drive is just another Winchester hard drive. Incidentally, that's also true of the Syquest EZ135.

One possible configuration is to have a hard drive as the data drive. Set it as a non-primary drive and then set a Zip drive as the C boot drive. Then you can boot any OS you like by changing cartridges.

Once I was sure the SCSI Zip drive worked on Pentafluge, I transferred it to Cyrus, my Cyrix 6x86-P166 system. Cyrix claims their P166 is completely compatible with, and faster than, a Pentium running at 190 MHz. I've used the Cyrix system for a couple of months now, and I have no reason to dispute that claim. It is fast, compatible, and reliable.

Cyrus has a PCI-bus Adaptec SCSI card with an external SCSI-2 connector port, so I moved the DRM-624X and SCSI Zip drive

You can have a series of OSes on different Zip cartridges and boot the one you like.

string over to it, and booted up with the DRM-624X turned off and no cartridge in the Zip drive. It came up fine. Cyrus does not have a Maxoptix optical drive, so the CD-ROM drive is E. As expected, the SCSI Zip drive displaced it, taking over the E slot for itself and moving the CD-ROM drive to F.

Unlike Pentafluge, Cyrus had a network drive mapped to F, but that didn't matter. The SCSI Zip drive became E, the CD-ROM drive became F, and the F network connection vanished. Actually, it didn't quite vanish. While I could read the CD-ROM drive as F, when I went into My Computer and looked at network drive connections, the pull-down menu still showed F as a network connection.

Shutdown was normal, and booting up with a cartridge in the Zip drive produced no different result from when there wasn't a cartridge. That is, while booting with a cartridge displaces the D partition on Pentafluge, it doesn't do that on Cyrus. No one I've spoken to can tell me why.

The next step was to connect both Zip drives to Cyrus. They worked fine, with the parallel drive taking the next empty drive letter (G), while the SCSI drive displaced the CD-ROM drive as usual. Finally, I turned on the DRM-624X, leaving both Zip drives attached to Cyrus. Everything worked. The SCSI Zip drive took over E; the internal CD-ROM drive became F; the

FieldWorks Field WorkStations™ have been put to the challenge by the World's most grueling and demanding work environments; from ice core testing in the sub-zero climates of Antarctica to testing nuclear reactor power plants worldwide to aiding corporate America's large field sales and field service fleets. Our attention to detail, MIL-SPEC rugged design and usability makes the FieldWorks computer line the logical choice in mission critical applications as well as your own specialized application.

FieldWorks has met the challenge of today's most severe working environments.

133 MHz Pentium...

ISA/PCI Slots...

CD-ROM...PCMCIA++...

Call today for an

information kit

on the complete

FieldWorks Rugged
product line.

Rugged Field Computing Starts Here!



Sales: 1-800-588-9144

9961 Valley View Road
Eden Prairie, MN, USA 55344
Phone: (612) 947-0856
Fax: (612) 947-0859

fieldworks
inc.

If you develop **MULTIMEDIA** technology, you're sure to have the kinds of problems that only NSTL testing can help you solve.

Solutions that will help you to lower technical support costs, avoid unexpected incompatibilities and unfulfilled expectations and achieve and/or confirm higher levels of graphic and audio performance.

In other words, NSTL's independent testing helps you to repeal Murphy's Law.

So, if you want to improve your marketing, enhance your product designs, sharpen your competitive edge...and make sure your products do, in fact, live up to all your advertising claims...and all your customers' expectations...come to NSTL.

THE LATEST METHODOLOGIES THE SAVVIEST ENGINEERS

Our state-of-the-art multimedia testing laboratory – one of 18 controlled-access labs – is dedicated to testing functionality, compatibility, performance, and usability across multiple platforms. In fact, no multimedia test suite is as comprehensive as ours. And our street-savvy testing engineers know how to find problems you never knew you had...before your customers find them.

CUSTOMIZED TESTING WITH PLUG-IN, PLUG-OUT EASE

We have Macs, all of the popular desktop PCs, multimedia notebooks, 2x to 8x internal and external CD-ROM drives, VESA and PCI video, SCSI, IDE and PCMCIA controllers, MPEG, and a Brobdingnagian library of CD-ROM titles.

So, we can test at any stage of product development on dozens of configurations with plug-in, plug-out ease. And world-class accuracy and reliability. Quickly. Hassle free.

That's because at NSTL everything is up and running. Ready to be configured to duplicate your environment and solve your problems. At a moment's notice.

**REPEAL
MURPHY'S
LAW**

"NSTL can test our [multimedia] programs on very short notice and with quick turnaround. And they've uncovered problems that we didn't catch after our own inhouse testing. Their understanding of multimedia technology and the end-user market have helped us deliver stronger bug-free programs." David Harmon, Manager of Technology and Development Support, Discovery Channel Multimedia.

Now it's your turn...

Build customer confidence. Sharpen your competitive edge. Let customers know that your products have passed rigorous, independent tests that verify their "as advertised" compatibility and functionality.

CALL 1-800-220-NSTL to request our brochure or a proposal detailing the scope, pricing, and scheduling of confidential product testing services, and/or to arrange a tour of our laboratories.

Do it right now and we'll send you a FREE copy of the PC Digest issue on multimedia notebooks. No risk. No obligation.



NSTL
QUALITY ASSURANCE THROUGH INDEPENDENT TESTING

NATIONAL SOFTWARE TESTING LABORATORIES

A Unit of Datapro Information Services Group
A Division of The McGraw-Hill Companies

625 Ridge Pike, Building D, Conshohocken, Pennsylvania 19428 610-941-9600 FAX: 610-941-9952
e-mail info@nstl.com World Wide Web <http://www.nstl.com>

DRM-624X took over G, H, I, J, K, and L; and the parallel Zip drive took the lowest unused drive letter after L.

The interesting thing about this is that several of the drive letters between F and L had been mapped to other network drives. Those network connections simply vanished—except that their ghosts remained in the network setup, and booting up with the DRM-624X turned off restored them.

The bottom line here is that both parallel and SCSI Zip drives work quite well. They read each other's disks just fine. The parallel Zip drive installs simply and works unobtrusively, finding an unused drive letter for itself.

The SCSI Zip drive installs easily if you already have SCSI devices; otherwise, you will have to install a SCSI card and drivers. This isn't particularly difficult, but it's certainly harder than just connecting a cable to the printer port. The SCSI Zip drive is more aggressive and will certainly displace a CD-ROM drive if brought up with a cartridge in the drive, and it may even displace a hard disk partition. You are

unlikely to prevent this no matter how hard you try. Otherwise, no damage is done.

The SCSI drive is about three times as fast as the parallel drive and perhaps half

I had hoped that Merlin, the newest version of Warp, would be able to make use of the Doubleshot 133's dual processors.

as fast as your average hard drive. Either can be a good way to add storage capacity to your system. I particularly like the parallel Zip drive as a backup-and-sneaker-net system, but, of course, unlike the SCSI Zip drive, you can't use it with a Mac. The SCSI drive works well with both Macs and PCs. If you need storage space and a backup system, either is pretty hard to beat. Recommended.

Having said all that, I have to point out that I have for about a year had a Fujitsu DynaMO 230 magneto-optical (MO) system attached to a SCSI port on an ancient Cheetah 386. I've used it across an Ethernet, and it's about as fast as the SCSI Zip drive. It has always been reliable. Nothing

in the Fujitsu literature mentions using this on a Mac, but SCSI is SCSI, and I'd be astonished if you couldn't connect the DynaMO 230 to a Mac. What you won't do is read the DynaMO cartridges on a parallel-

port device. Still, the DynaMO 230 works. The drive and cartridges are smaller than the Iomega Zip drives and their cartridges, and each DynaMO cartridge holds a bit more than 200 MB compared to the Zip drive's 100 MB.

We installed the beta version of NT 4.0 on the Doubleshot 133, which had previously been running NT 3.51. At one time, it ran OS/2, and I had hoped that Merlin, the newest version of Warp, would be able to make use of the Doubleshot 133's dual processors, but IBM didn't put that feature in Merlin. IBM is beta-testing SMP for Warp Server. For now, to run OS/2 with symmetric multiprocessing (SMP),

BYTE

BYTE Customer Service/ Ordering Information

	Customer Service	Orders
Belgium	0800 71260	0800 71635
Denmark	8001 8934	8001 7728
Germany	0130 829 448	0130 826 112
Netherlands	06022 4959	06022 2146
United Kingdom	0800 973 195	0800 973 017
Italy	1678 79415	1678 76155
Spain	900 943539	900 933539
Sweden	020 793386	020 791136
Switzerland	155 24 18	155 72 57
France	0591 6068	0591 6088
Other Intl	+353 91 752792	+353 91 771385
US	1-800-232-2983	1-800-257-9402
US/Canada/Mexico	609-426-7676	609-426-5526
Fax:		
International	+353 91 752793	609-426-5434
US	609-426-7087	609-426-5434

e-mail:

new orders mporders@mcgraw-hill.com
customer service mpestsve@mcgraw-hill.com
address change mpaddchg@mcgraw-hill.com

McGraw-Hill web: //www.mcgraw-hill.com/multipub

Mail:

BYTE
PO Box 555
Hightstown NJ 08520, USA

BYTE
Box 72
Galway, Ireland

A Division of The McGraw-Hill Companies



A Message to Our Subscribers

From time to time we make the BYTE subscriber list available to other companies whose products or services would be of interest to our readers. We take great care to screen these companies, choosing only those who are reputable. Furthermore, subscriber names are made available for direct mail purposes only; telemarketing calls are strictly prohibited.

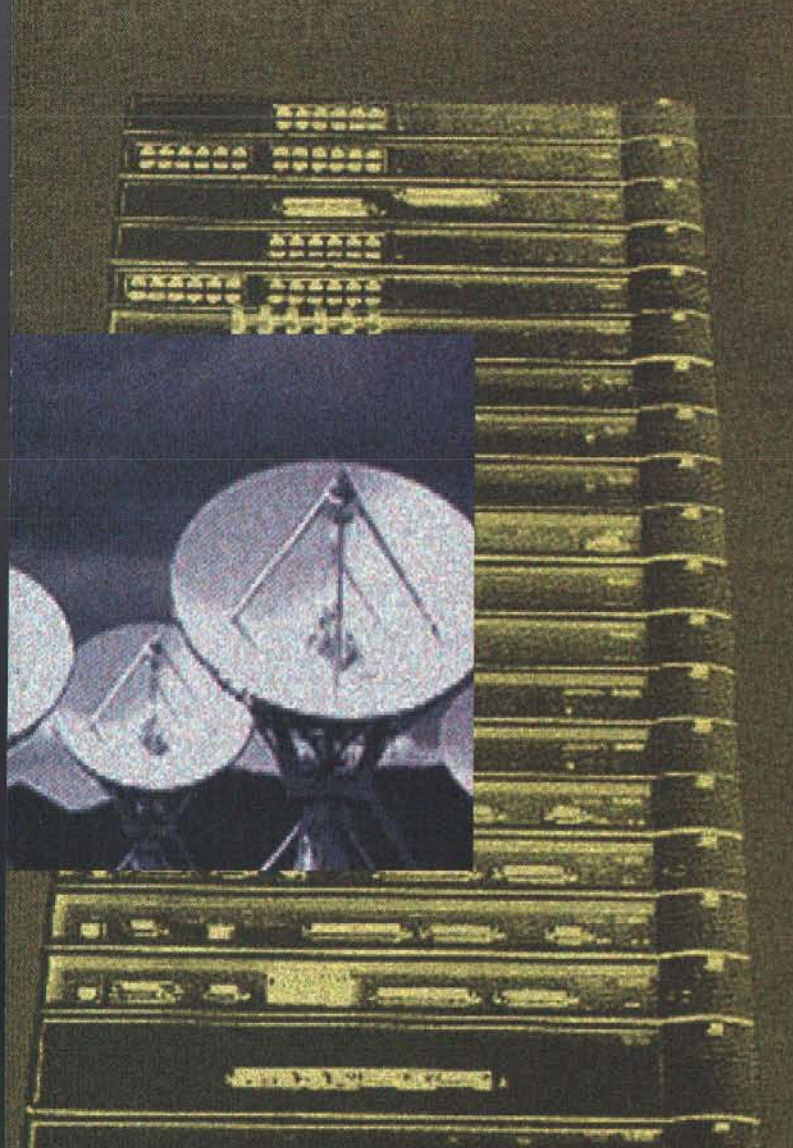
Many BYTE subscribers appreciate this carefully managed program, and look forward to receiving information of interest to them via the mail. While we believe this information is of benefit to our subscribers, we firmly respect the wishes of any subscriber who does not want to receive promotional literature. Should you wish to restrict the use of your name, please send your request (including your magazine mailing label, name, address, and subscription account number) to:

BYTE

BYTE Magazine Subscriber Services
PO Box 555, Hightstown, NJ 08520

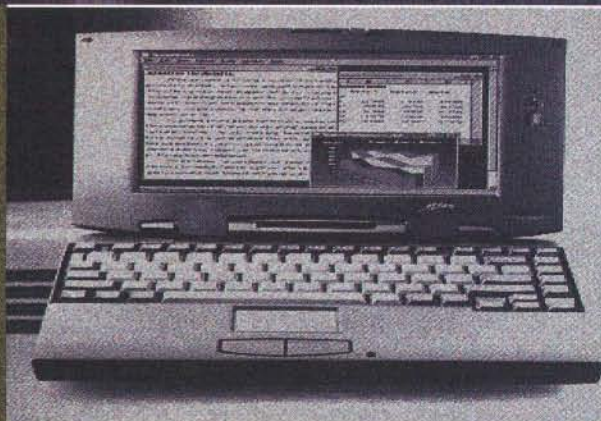
A Division of The McGraw-Hill Companies





Interop Online.

*It's how you
keep up to speed
in networking.*



Need up to the minute networking information? You don't have to wait for the #1 show in networking anymore. Just speed right to the site — Interop Online, the year-round resource for the networking community. The latest industry news, reviews, expert editorial, technology breakthroughs, links to product information, and the most comprehensive buying tool available are all just a click away on Interop Online.

You can also register online, arrange your show and conference schedule, and create the ultimate NetWorld+Interop experience with the Interop Show & Conference Planner (sponsored by **NOVELL**).

Interop Online. It's the networking information you need... now.

© 1996 Software Etc., Inc. Corporate names and trademarks are the property of their respective companies.

[<http://www.interop.com>]

Q: What does it take to deploy a superior client/server application? A: A SUPERIOR SERVER

START with the most advanced client-side SDK on the market: c-tree® Plus at \$895.

- Complete "C" Source code
- ROYALTY FREE (Client Side)
- Multiple supported protocols
- Fast, portable, reliable
- Powerful features like transaction processing
- Win95, NT, and Windows 3.1 ready

ADD a strong, multi-platform, industrial-strength Server that supports.

- File mirroring
- Heterogeneous networking
- Automatic disaster recovery
- Multi-threaded design
- Best price/performance available: from \$445- \$3745

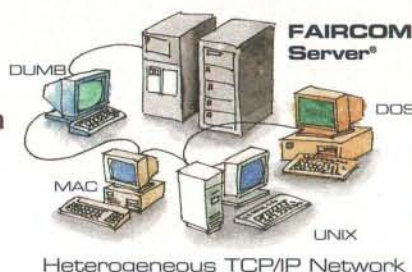
You can't find a better client SDK with these features!
Over sixteen years of proven reliability and performance.
No one else supports over 30 platforms in this price range!

c-tree Plus®

- Complete C Source
- Single/Multi User
- Client/Server (optional)
- Full ISAM functionality
- No Royalties
- Transaction Processing
- Fixed/Variable Length Records
- High Speed Data/Index Caching
- Batch Operations
- File Mirroring
- Multiple Contexts
- Unsurpassed Portability

RESULT? A solid, economical, easily deployable product that fits your needs.

- Portable
- Scalable
- Exceptional Performance
- Flexible
- Easy Server distribution
- Convenient OEM terms



FairCom Server®

- Client/Server Model
- Transaction Processing
- Requires <2MB RAM
- Online Backup
- Disaster Recovery
- Rollback - Forward
- Anti-Deadlock Resolution
- Client-side "C" Source
- Multi-threading
- Heterogeneous networking
- File Mirroring
- OEM/Source Available

FOR YOUR NEXT PROJECT CALL FAIRCOM: YOU CAN'T FIND A BETTER HETEROGENEOUS CLIENT/SERVER SOLUTION!

Also inquire about these FairCom products:

d-tree™ r-tree® ODBC Driver

FAIRCOM®

CORPORATION

WWWWeb Address: <http://www.faircom.com/>
800-234-8180

U.S.A. 4006 W. Broadway - Columbia, MO 65203-0100
phone (573) 445-6833 fax (573) 445-9698

EUROPE Via Patrioti, 6-24021 Albino (BG) - ITALY
phone (035) 773-464 fax (035) 773-806

JAPAN IKEDA Bldg. #3,4f-112-5, Komei-chou - Tsu-city, MIE 514 Japan
phone (0592) 29-7504 fax (0592) 24-9723

you are stuck with clunky OS/2 2.11. While I rather like OS/2 Warp Connect, and I think I like Merlin, I refuse to go back and relearn version 2.11.

Installation of NT 4.0 was really simple on the Doubleshot 133. I haven't yet tried installing it on a machine running Windows 3.1 or Win 95; I'm told that's a bit more difficult, but nothing excessive. One thing, though: be sure you know the IRQ and port address settings for all your hardware. Unlike Win 95, NT doesn't even try to be Plug and Play. On the other hand, it won't change your settings for you once you have them the way you like.

We haven't done a lot of work with NT 4.0, but what I've seen I like a lot. It's much more like Win 95 than 3.11. In fact, you can use NT 4.0 quite a while before you notice it isn't Win 95. It's also faster. Although few current applications have threaded code able to take advantage of the Doubleshot 133's dual processors, ordinary single-threaded jobs are still faster because NT 4.0 is able to trade off between processors, putting all the background stuff like network and disk operations, monitoring the uninterruptible power supply (UPS) status, etc., on one processor while the other runs your task.

In practice, it's not quite that simple. NT 4.0 has a utility that shows a graph of processor-use history. There are two such graphs for a dual-processor system, and it's interesting to watch how NT switches loads between processors as you load it down by networking to the server.

There was a time when OS/2 was a technically more elegant OS than NT, and OS/2 Server was about the best server software around. I don't think that is true any longer; IBM long ago lost the marketing edge and may now have lost the technical edge as well. NT 3.51 is very stable and makes for a good server system; while NT 4.0, even in the beta version, is fast, easy to use, simple to install, and looks like Windows to most of your network. Moreover, IBM is rapidly adapting its server software to run just fine on NT systems. If you have a large computer network system and the resources to manage it, you may have a need for OS/2; but NT 4.0 seems to be the NT for the rest of us. More when I know more, but my first impressions of NT 4.0 are very positive.

Meanwhile, the little Doubleshot 133 remains the quietest system in the house. It's very stable, and running NT 4.0, it may be the fastest networked system we have



HTTP://WWW.BYTE.COM

**IT'S AMAZING HOW MANY
COMPUTING EXPERTS PRACTICALLY LIVE
AT THIS ADDRESS.**

With so many web sites popping up today, it's hard to know which ones Net the best results. Especially if you're an advertiser looking to reach key Information Technology prospects.

Fortunately, the answer is close at hand. It's called The BYTE Site, and more computing influencers worldwide call it "home" than just about any address on the Web.

The BYTE Site is the online version of BYTE magazine, the worldwide technical authority for computing experts. That means it's chockfull of insights and information about the IT market from products to applications to trends. On The BYTE Site, visitors can instantly access every BYTE article published since 1993 through the BYTE Archive. Read all about the newest products and technologies in our Virtual Press Room. Share viewpoints with BYTE editors worldwide by on-site Email. Even download industry standard CPU test suites from our BYTEMarks benchmark service.

With features like these, it's no wonder The BYTE Site logged nearly 150,000 visits this past January alone, and posted an overall repeat visit rate of 41%. Not surprisingly, it's become equally popular among advertisers. That's because



The Byte Site offers such interactive marketing options as hot-linked AD-Action buttons to showcase product information, catalog listings and data sheets. Plus our Virtual Press Room where users can access the latest press releases from your company.

To learn more about The BYTE Site, call John Griffin, VP/Publisher at 603.924.2663. Or find him on The BYTE Site at <http://www.byte.com>. You'll discover reaching computing influencers worldwide is easy once you know where they live.

BYTE

A Division of The McGraw-Hill Companies



THE GLOBAL AUTHORITY FOR COMPUTING TECHNOLOGY.

here. Those dual processors really speed things up. Just now, it is the NT experimental machine, but once I'm sure NT is stable, I think I'll put the Micropolis external 4-GB drive on the Doubleshoot 133 and make it the main Chaos Manor server.

Visioneer's PaperPort Vx is a blooming little miracle.

This is a gadget about 4 inches tall, 3 inches deep, and a foot wide. It sits anywhere you like and connects to a serial port with a normal cable. Once installed, you activate it by feeding it a sheet of paper. It

reads your papers, one sheet at a time, into image files, one file per sheet.

Installation was simple: I plugged the PaperPort Vx into the COM1 serial port, connected its power supply, and ran the installation program. The software seems to have scanned my system, because when it was done, the PaperPort "desktop" had icons for Microsoft Word and WinFax, as well as "printer," Exchange, Excel, WordPad, and Paint.

I fed in a printout of some e-mail I'd received on BIX. The PaperPort Vx pulled it through and quickly made an image file

of the document. Then I dragged the image onto the WinFax icon and sent it to my fax machine downstairs. It came out quite readable, as good as any fax comes out on my old thermal fax machine.

Then I dragged the image onto the Microsoft Word icon. That automatically activated the OCR to produce a Word document. It made one mistake: the original said "pc." The OCR read that as "pe."

I've also fooled around with other stuff. There are a bunch of settings to get different qualities of OCR performance and image quality. It's all quite intuitive, and now I've got electronic versions of some newspaper articles I've been saving, meaning I can find them by electronic search now. I think I'll do a lot more of that.

I had one major glitch. Once when I fed in a sheet of paper, the electric fan blew it about as it emerged, and the program said the read had failed, although examination of the document image didn't show any problems. After that, though, the PaperPort Vx wouldn't feed paper at all, and the software kept telling me there was no PaperPort device on COM1. I even tried turning off the computer and bringing it back up, and still the Visioneer software insisted there was no PaperPort on COM1. Finally, I turned off the PaperPort itself by pulling its power cord. That worked: it processed the next sheet of paper I fed it just fine. Apparently that "reset" it.

Visioneer also makes a keyboard with a PaperPort built into it, called the PaperPort ix. It has a separate power supply, so presumably you can "reset" it the same as with the stand-alone version. I'm fairly picky about keyboards, so I haven't tried it yet, but I'll have one of the interns install it at his station. I'm sure it will work; my only question is whether I'd like the PaperPort ix as a keyboard. More another time.

Disk space keeps getting cheaper. You can put a lot of documents on a 100-MB Zip cartridge; and that's a lot of paper you don't have to keep around. My son Richard uses a PaperPort to keep his paper files small, and it sounds like a good habit to get into. I expect I'll be writing about this again.

"Tough questions to ask about UPSs. And the answers you'll get if you ask..."



Aren't all UPS warranties alike?

No. Deltec offers the industry's longest, most comprehensive warranties including 5- and 10-year pro-rated warranties, \$25,000 Load Protection, and a 60-Day No Questions Asked Customer Satisfaction Guarantee.

Aren't all UPS batteries alike?

Batteries, the most critical component of any UPS, are alike. Deltec is the *only* manufacturer to offer Advanced Battery Management (ABM™) that uses a patented 3-stage charger to double battery life. Exclusive circuitry also provides reliable advanced warning when batteries require service — so users are never left in the dark.

What determines price/performance value?

From PCs to mainframes, Deltec UPSs are, the price/performance leaders in the areas most important to users: reliability, ease-of-use, and customer support. Deltec's goal is to offer products with unique user benefits at very competitive prices.

How important is a broad product line?

Deltec's roots were established protecting critical mainframe applications. We now bring those advanced features to micro UPSs with the most comprehensive product offering available and factory trained service engineers throughout the nation.

How do you evaluate system reliability?

After more than 25 years as a technology leader end-users, independent test labs, and leading computer manufacturers alike have rated Deltec UPSs #1 in this vital area.



Why is power management software important?

Protecting data is as important as safeguarding hardware. Deltec's power management software saves data throughout the network and ensures graceful shutdown during extended blackouts. LanSafe III and FailSafe III packages are compatible with all major operating systems — and work with Deltec's, as well as other manufacturer's, UPSs.

Call today for a FREE info kit:

1-800-DELTEC-1

DELTEC

Innovators in Power Protection for 25 Years



e-mail: info@deltecpower.com

<http://www.deltecpower.com>

You'll have noted that my primary e-mail address remains jerrypp@bix.com. BIX began as the BYTE Information Exchange and was eventually sold by McGraw-Hill to Delphi, which was later bought by News Corp. Recently, a group of Delphi/BIX employees with some outside backing bought both BIX and Delphi

and are making a going concern of both.

BIX isn't for everyone. It's small, and the interface is text-based and command-line-driven. It looks old and clunky. The appeal of BIX is the information density. BIX never exploded the way the Internet did, and as a consequence, there are intelligent technical conversations and very little spam. When you ask a question on BIX, you get a reliable answer.

My usual access to BIX is through a shareware program called Galahad. This is a Windows/Win 95 program that goes out to BIX, logs on, downloads all my e-mail and all the message traffic in the conferences I belong to, and then logs off, letting me deal with everything off-line with reasonable text editors. It's one of the main reasons I stay with BIX.

The main problem with Galahad has been using it on multiple machines. Galahad keeps all kinds of reference files, archives, and databases, and transferring all that when I want to use a different machine is a major pain. Then, just today, on BIX, BYTE technical editor Russell Kay suggested the solution: put Galahad—pro-

gram, logs, files, and all—on a Zip cartridge. Carry the Iomega parallel Zip drive in checked luggage—a good idea for a backup system since I do a lot of work on the road—and access BIX that way. When I get back home, I attach the Zip drive to the parallel port of the system I'm using.

I haven't tried this, but I will. I'll probably go even further: since I have five Internet accounts and three e-mail boxes, I'll put all that Internet stuff on a Zip cartridge. Working out a backup system shouldn't be too difficult. Yet one more use for the parallel Zip drive.

Meanwhile, BYTE readers weary of the bickering and nonsense in much of the Internet might think about BIX, where all conferences are moderated and most of the participants really do know what they're talking about.

Two vital books for computer pros: *The Hard Disk Data Base* and *The BIOS Companion*, both by Phil Croucher, and both exactly what their titles imply. If you work with odd computers, particularly older ones, these are invaluable: page after

page of technical data, all in one place.

The game of the month is the Strategic Studies Group's *The Complete Carriers at War*. All the older Carriers at War games and construction tools, plus new scenarios, including the North Atlantic and Mediterranean. Suppose the Germans had gotten control of the entire French navy: could the British have beaten the combination? Plus the entire Pacific carrier war. Lots of realism and no arcade action.

The CD-ROM of the month is *The 1996 Grolier Multimedia Encyclopedia*. It's well balanced between details and brevity. Philip Jose Farmer defined a dullard as a person who can go to the encyclopedia, look up one item, read it, and close the book. It's fun to browse Grolier.

The book of the month is by Cicely Veronica Wedgwood, *The Thirty Years War* (Routledge). I thought I knew all I wanted to about the Defenestration of Prague, Friedrich the Winter King, Father Tilly, Cardinal Richelieu and Father Joseph "the gray eminence," and Wallenstein, but once I opened this wonderful book, I found a wealth of details more fascinating than any

Imagine if you could take all of your forms-based data and instantly send it to your database—**no manual data entry, no delays**. Stop imagining and do it today with **TELEform**, the most accurate and affordable forms processing software available.

TELEform has the power, speed and accuracy you need to automatically collect data from scanned or faxed-in forms. Using familiar communications—paper and pen, fax machines and modems—**TELEform** reads hand-printed, typed and filled-in data.

See us
at COMDEX
Booth M232



Cardiff Software
PHONE: 619-752-5200 FAX: 619-752-5222

**AUTOMATED
DATA ENTRY.**

**ACCURACY
FROM A TO Z.**

READS MACHINE
PRINT TEXT (OCR)

READS HAND PRINT
TEXT (ICR)

READS OPTICAL
MARK RECOGNITION
ENTRIES (OMR)

READS BARCODES



Eliminating data entry means your staff will be free for more productive activities. Having data entered in seconds means increased productivity—you'll work smarter, capture more data, faster and with less effort.

Thousands of companies use **TELEform** to make their businesses more efficient. Join them by calling 800-659-8755 today.

For more information, visit Cardiff Software's Web site: <http://www.cardiffsw.com>.

REGISTRATION FORMS,
SALES ORDERS, CLAIMS,
TIME CARDS, SURVEYS
AND MORE.



triCR includes technologies licensed from Advanced Telecommunications Technologies, iRecognition GmbH and others.

novel. Part of Hitler's popularity came from his promise to upset the Peace of Westphalia that ended the Thirty Years War.

The computer book of the month is by Gary Frerking, Nathan Wallace, and Wayne Nidderly, *Borland Delphi How-To* (The Waite Group). I've neglected Borland Delphi in my language discussions,

and I shouldn't: it's a practical language every bit as useful as Visual Basic, and, being rooted in Pascal, it has a more logical structure. The book teaches through examples and includes a CD-ROM with hundreds of subroutines that are useful in themselves as well as worth studying.

A computer book I overlooked when it

first came out is Susan A. Kitchens' *The KPT Bryce Book* (Addison-Wesley). Bryce is the landscape-generator software portion of the Kai's Power Tools series; Kai's Power Tools are one of the reasons Mac computers are so much fun. Kitchens starts with basics and explains how to build structures, from castles to planets, with examples, including the inevitable CD-ROM of routines and pictures. If you use a Mac, you'll like this.

As usual, I've written more than will appear in the magazine. You can find it on BYTE's Web site. You might also want to check out <http://www.earthlink.net/discontinuity>, where John C. Dvorak and I argue critical issues. **B**

Jerry Pournelle is a science fiction writer and BYTE's senior contributing editor. You can write to Jerry c/o BYTE, One Phoenix Mill Lane, Peterborough, NH 03458. Please include a self-addressed, stamped envelope and put your address on the letter as well as on the envelope. Due to the high volume of letters, Jerry cannot guarantee a personal reply. You can also contact him on the Internet or BIX at jerry@bix.com.

PRODUCT INFORMATION

The Complete Carriers at War \$69.95

Strategic Studies Group
Pensacola, FL
(904) 469-8880
fax: (904) 469-8885
Circle 977 on Inquiry Card.

Cyrix 6x86-P166 \$3939;
without monitor, \$3389

Cyrix Corp.
Richardson, TX
(800) 340-7501
(214) 968-8388
fax: (800) 340-7532
<http://www.cyrix.com>
Circle 978 on Inquiry Card.

Doubleshot 133 (with OS/2 SMP 2.11) or Landmark P133

VPM Doubleshot (with Windows NT) \$2599

Diamond Flower, Inc.
Sacramento, CA
(800) 808-4334
(916) 568-1234
fax: (916) 568-1233
<http://www.dfiusa.com>
Circle 979 on Inquiry Card.

The 1996 Grolier Multimedia

Encyclopedia \$59.99
Grolier Interactive, Inc.
Danbury, CT
(800) 285-4534
(203) 797-3530
fax: (203) 797-3130
<http://www.grolier.com>
Circle 980 on Inquiry Card.

PaperPort Vx about \$299
PaperPort ix about \$349

Visioneer, Inc.
Palo Alto, CA
(800) 787-7007
(415) 812-6400
fax: (800) 505-0175
or (415) 855-9750
<http://www.visioneer.com>
Circle 981 on Inquiry Card.

Zip 100-MB Removable Disk Drive SCSI or parallel version,
\$199.95

Iomega Corp.
Roy, UT
(800) 697-8833
(801) 778-1000
fax: (801) 778-5763
<http://www.iomega.com>
Circle 982 on Inquiry Card.

SOMETHING MISSING?

Complete your BYTE collection by ordering Back Issues today!

	1991	1992	1993	1994	1995	1996
January	☐	☐	☐	☐	☐	☐
February	☐	☐	☐	☐	☐	☐
March	☐	☐	☐	☒	☐	☐
April	☐	☐	☐	☐	☐	☐
May	☐	☐	☐	☐	☐	☐
June	☐	☐	☐	☐	☐	☐
July	☐	☐	☐	☐	☐	☐
August	☐	☐	☐	☐	☐	☐
September	☐	☐	☐	☐	☐	☐
October	☐	☐	☐	☐	☐	☐
November	☐	☐	☐	☐	☐	☒
December	☐	☐	☐	☐	☐	☒
Special Issues	☒	☒	☒	☒	☒	☒
	Outlook '92	Windows Portability	Windows '93 B Guide Summer '93 B Guide Fall '93			

Special Issues U.S. Delivery \$3.00, Foreign Delivery \$4.00 • 1990 thru 1996 U.S. Delivery \$6.50, Foreign Delivery \$8.50, Canada & Mexico \$7.00 • All issues prior to 1990 U.S. Delivery \$3.00, Foreign Delivery \$4.00. (Call for availability) These prices include: postage (US), surface mail (foreign). • All checks must be in U.S. funds and drawn on a U.S. bank.

Please indicate which issues you would like by checking (✓) the boxes. Send requests with payment to:

BYTE Back Issues, One Phoenix Mill Lane, Peterborough, N.H. 03458, (603) 924-9281

☐ Check enclosed

☐ Charge:

☐ VISA

☐ MasterCard

☐ American Express

Card #

Exp. Date

Name

Signature

First Name

Last Name

Address

Address

City

State

Zip



A Division of The McGraw-Hill Companies

BYTE



BUYER'S GUIDE

Essential Products
and Services for
Technology Experts

Mail Order

Top mail-order vendors offer the latest hardware and software products at the best prices. **Page 170**

Hardware/Software Showcase

Your full-color guide to in-demand hardware and software products, categorized for quick access. **Page 187**

Buyer's Mart

The BYTE classified directory of computer products and services, by subject so you can easily locate the right product. **Page 196**



FREE Now
Up-to-Date
a \$99 retail value*

Jaz™ drive

The unlimited
personal hard drive

Simply plug Iomega's Jaz drive into a SCSI port and you have a second hard drive with a full gigabyte of capacity instantly. Unlimited storage space is yours by simply adding disks as needed.

- ◆ 12ms average seek time, up to 6.6MB per second sustained transfer rate
- ◆ Burst transfer rate: 10MB/sec
- ◆ Buffer size: 256KB read/write
- ◆ Interface: Fast SCSI-2
- ◆ 1-year limited warranty

Internal.....	\$399 ⁰⁰	CDW 62710
External.....	\$499 ⁰⁰	CDW 58389
1GB Jaz disk PC.....	\$124 ⁰⁰	CDW 62711

Free Now Up-to-Date personal organizer software on CD when you register your new Iomega Zip, Jaz or Ditto drive. Offer fulfilled via manufacturer coupon. Offer valid 8/1/96-1/31/97.

HARDWARE, SOFTWARE & PERIPHERALS AT DISCOUNT PRICES

WHY
NOT
RETAIL?

CDW® Sells
For Less!™

TEXAS INSTRUMENTS TravelMate 6020 and 6030

Setting the standard in high
performance and flexibility

- ◆ 120MHz (TM6020) or 133MHz (TM6030) Intel Pentium® processor
- ◆ 8MB (TM6020) or 16MB (TM6030) RAM standard
- ◆ 1.08GB (TM6020) or 1.35GB (TM6030) hard drive
- ◆ Optional integrated 6X CD-ROM drive
- ◆ 11.3" (TM6020) or 12.1" (TM6030) TFT active-matrix SVGA color display
- ◆ 28.8K bps modem

TM6020.....	\$4041 ⁹⁵	CDW 70835
TM6030.....	\$4806 ²⁶	CDW 70837

The Intel Inside® Logo and Pentium® are Registered Trademarks of Intel Corporation



COMPUTER DISCOUNT WAREHOUSE™

SOFTWARE

Adobe PageMaker V6.0 WIN 3.5/CD	\$45.78
Adobe PageMaker V6.0 WIN upg 3.5/CD	132.81
Adobe Photoshop V3.0.5 WIN 3.5/CD	\$45.78
Adobe Photoshop V3.0.5 WIN upg	159.55
Academy Backup for Windows 95	56.90
Corel DrawPerfect Suite V7.0 WIN95 vers upg	241.54
Corel DrawPerfect Suite V7.0 WIN95 upg 3.5/CD	133.70
Corel DrawPerfect Suite V7.0 WIN95 upg CD	93.15
Corel DrawPerfect Suite WIN 3.5/CD	274.58
Corel DrawPerfect Suite WIN upg CD	241.54
Corel DrawPerfect Suite WIN upg 3.5/CD	133.70
Corel DrawPerfect Suite WIN upg CD	91.77
CorelDRAW V6.0 WIN95 CD	438.57
Datasmart Procom Plus V3.0 WIN95WIN	121.17
Datasmart Procom Plus V3.0 WIN95WIN upg	68.09
Delrina WinFax PRO V7.0 WIN95	77.35
Delrina WinFax PRO V7.0 WIN95 CD	78.62
GoldMine V3.0 WIN95	169.52
Holix Hurricane V2.0 WIN95WIN	42.99
Infinit QuickBooks V4.0 WIN	94.29
Infinit QuickBooks V5.0 WIN	41.73
Lotus 1-2-3 V5.0 WIN	291.45
Lotus 1-2-3 V5.0 WIN spec upg	93.15
Lotus ccMail Mobile V6.0 WIN	126.00
Lotus SmartSuite 96 WIN95 upg CD	138.72
Lotus SmartSuite V4.0 WIN upg	138.72
McAfee VirusScan V2.0 WIN95	44.23
McAfee VirusScan V2.2 DOS	43.93
McAfee VirusScan V2.2 WIN	44.17
Microsoft Access V2.0 WIN	198.94
Microsoft Access V2.0 WIN upg	114.90
Microsoft Encarta Encyclopedia 1996 WIN CD	44.94
Microsoft Excel V5.0 WIN comp upg	114.90
Microsoft FrontPage V1.1 WIN95	137.54
Microsoft MS-DOS V6.22 upg	51.52
Microsoft Office Pro V4.0 WIN CD w/Bookshelf	538.24
Microsoft Office Professional V4.3 WIN license	458.68
Microsoft Office Professional V4.3 WIN upg	344.25
Microsoft Office Pro w/Access WIN95 upg	534.50
Microsoft Office Professional WIN95	539.03
Microsoft Office Pro WIN95 CD w/Bookshelf	539.03
Microsoft Office Pro WIN95 upg CD w/Bookshelf	514.29
Microsoft Office Std WIN95	449.14
Microsoft Office Std WIN95 CD	448.89
Microsoft Office Std WIN95 upg	223.97
Microsoft Office Std WIN95 upg CD	223.97
Microsoft Office V4.2 WIN	448.89
Microsoft Office V4.2 WIN license	382.03
Microsoft Office V4.2 WIN upg	265.72
Microsoft Plus! WIN95	44.84
Microsoft Plus! WIN95 CD	45.13
Microsoft Project V4.0 WIN	411.89
Microsoft Publisher CD Deluxe WIN95	69.29
Microsoft Publisher V2.0 WIN	69.29
Microsoft Visual Basic Pro V4.0 WIN95WINNT CD	442.49
Microsoft Visual Basic Pro V4.0 WIN95WINNT upg CD	447.93
Microsoft Visual C++ Subscriptions WIN95	183.47
Microsoft Windows 95	94.77
Microsoft Windows 95 upg	94.77
Microsoft Windows 95 upg CD	94.77
Microsoft Windows V3.11	92.06
Microsoft Word V6.0 WIN upg	114.90
Microsoft Works V3.0 WIN	45.13
Microsoft Works WIN95	45.13
Quark QuarkPress V2.32 WIN	599.58
Quark QuarkPress V3.0 WIN95WIN	52.16
Symantec ACT! V2.0 WIN	171.24
Symantec Norton AntiVirus V3.0 DOS/WIN	48.20
Symantec Norton AntiVirus WIN95	72.14
Symantec Norton AntiVirus WIN95 trade-up	33.75
Symantec Norton NT Tools V1.0 WIN NT CD	45.00
Symantec Norton Utilities V8.0 DOS/WIN	112.53
Symantec Norton Utilities WIN95	116.15
Symantec Norton Utilities WIN95 trade-up	57.24
Symantec pcANYWHERE V2.0 WIN	119.21
Symantec pcANYWHERE V5.0 DOS	121.17
Symantec pcANYWHERE V7.0 WIN95/NT upg	61.79
Symantec pcANYWHERE32 V7.5 WIN95/NT	131.24
Symantec WinFax PRO V4.0 WIN	78.14
Ventana Netscape Navigator V2.0 WIN	43.94
Visio Technical V4.1 WIN95WIN/NT	259.78
Visio V4.0 WIN 3.5/CD	132.88

NETWORKING PRODUCTS



NetWare 4.1	
5-user CD	715.60
10-user CD	1615.15
25-user CD	2391.71
50-user CD	3231.25
100-user CD	4509.48
NetWare 3.12	
5-user 3.5"	699.03
10-user 3.5"	1574.17
25-user 3.5"	2325.28
50-user 3.5"	3231.25
100-user 3.5"	4509.48
GroupWise V4.1	
Multilingual client/admin CD	471.75
Single-user license	93.91
5-user license	487.29
25-user license	1964.39
50-user license	3577.01
ManageWise V2.0	
10-user CD	875.62
50-user CD	1932.50
100-user CD	2642.32
LAN Workplace V5.0	
Single-user CD	169.45
10-user CD	1344.42
100-user CD	4678.57



BackOffice Server V2.0	
Version upg CD	686.74
Comp upg CD	1599.63
Full version CD	1599.63
Single-client license	1159.88
20-client license	3697.84
Windows NT Server V3.51	
Server upg CD	628.03
Server CD	822.50
Network Value Pack upg	754.69
Network Value Pack w/Internet Info Server	899.15
Single-client license	371.86
20-client license	503.27
Windows NT Server V4.0	
Upg + 5-client license CD	379.04
Upg + 10-client license CD	503.25
Comp upg + 5-client license CD	379.04
Comp upg + 10-client license CD	503.25
Server + 5-client license CD	734.94
Server + 10-client license CD	869.73
Single-client license	16.92
Single-client license	34.08
Microsoft SQL Server V6.5	
Server + 5-client license CD	1225.23
Server + 10-client license CD	1781.33
Server + 25-client license CD	3555.82
5-client license	663.76
20-client license	2984.26
Microsoft Systems Mgmt Server V1.1	
SMS Server CD	579.18
SMS Server upg CD	563.18
Single-client license	718.04
Microsoft SNA Server V2.11	
SNA Server CD	359.59
Single-client license	55.37
20-client license	861.40
Microsoft Exchange Server V4.0	
Server + 5-client license CD	869.76
Server + 10-client license CD	1218.21
Server + 25-client license CD	1899.72
3Com	
3C900 EtherLink XL PCI 10BT	112.20
3C900 EtherLink XL PCI 10BT 5-pack	514.60
3C900 EtherLink XL PCI combo	132.85
3C900 EtherLink XL PCI combo 5-pack	587.19
3C900 Fast EtherLink XL PCI 10/100BT	137.01
3C900 Fast EtherLink XL PCI 10/100BT 5-pack	606.67
SuperStack II Hub 12-port 10BT	511.56
SuperStack II Hub 24-port 10BT	871.76
SuperStack II Hub 48-port 10BT	1629.95
SuperStack II Switch 10/20 12-port Enet	2491.73
SuperStack II Switch 1000 24-port Enet	3117.31
SuperStack II Hub 12-port 10BT	1192.51
SuperStack II Switch 2000 TR 12-port	5349.47
Bay Networks	
BayStack 12-port hub 10BT	592.18
BayStack 24-port hub 10BT	1053.70
BayStack 12-port hub 100BTX	1555.51

NETWORKING PRODUCTS



LANtastic V7.0	
Starter kit 3.5" + CD	245.54
Add-on kit 3.5" + CD	128.53
1-user comp upg CD	57.36
10-user comp upg CD	232.51
ModemShare V7.0	
1 shared port, unlimited users	87.91
4 shared ports, unlimited users	291.24
32 shared ports, unlimited users	1559.24



Netelligent 10BT PCI controller	103.50
Netelligent 10/100BTX PCI controller	139.05
Netelligent 2000 8-port 10BT repeater	484.20
Netelligent 2000 16-port 10BT repeater	619.70



EtherExpress 16 10BT	103.19
EtherExpress 16 10BT 5-pack	458.78
EtherExpress 16 combo	123.25
EtherExpress 16 combo 5-pack	642.71
EtherExpress PRO/10Mbps ISA	98.23
EtherExpress PRO/100Mbps PCI	138.01
EtherExpress PRO/100Mbps EISA	246.25
EtherExpress PRO/100Mbps PCI 5-pack	619.36
NetPortExpress EL Ethernet	373.30
TokenExpress PRO ISA LAN adapter	245.73



Combo Ether16 LAN card	36.66
Combo EtherPCI LAN card	79.02
Combo PC/Ethernet card 10BT	105.88
PC Card LANmodem 10BT	359.85



EtherEZ coax ISA	91.63
EtherEZ 10BT ISA	92.03
EtherEZ combo	104.61
EtherPower 10BT PCI	117.39
EtherPower 10/100BT PCI	143.61
EtherPower coax PCI	148.63

DATA STORAGE

COLORADO	
Jumbo 350 350MB TBU internal	59.70
Jumbo 1400 1.3GB TBU internal	226.67
Trakker 350MB TBU parallel	159.12
T1000E 800MB TBU parallel	169.68
iomega	
Zip drive 100MB parallel	199.00
Zip drive 100MB SCSI	199.00
Ditto Easy 800MB Travan internal	119.00
Ditto Easy 800MB Travan external	149.00
Jaz drive 1GB internal SCSI-2	399.00
Jaz drive 1GB external SCSI-2	499.00
Jaz drive 1GB cartridge	124.00



10XTREME 10X CDR internal	232.71
RC Explorer 2X CDR recorder internal	251.81
RC Explorer 2X CDR recorder internal	441.20
RC Explorer 2X CDR recorder external	942.73
Vertex 2.6GB optical hard drive internal	1311.61
Vertex 2.6GB optical hard drive external	1314.07



EZ135 135MB IDE internal	119.23
EZ135 135MB SCSI external	119.23
EZ135 135MB external	119.23
EZ135 135MB cartridge	19.45
EZFlyer 230MB SCSI external	291.47
EZFlyer 230MB external	291.47
EZFlyer 230MB cartridge	29.47

OVERDRIVE PROCESSORS



Intel OverDrive DX4/75	142.12
Intel OverDrive DX4/100	178.74
Intel OverDrive Pentium 63MHz	158.66
Intel OverDrive Pentium 83MHz	189.27
Intel OverDrive Pentium 100MHz upg for 5/90	253.45
Intel OverDrive Pentium 125MHz upg for 5/90	259.24
Intel OverDrive Pentium 150MHz upg for 5/90	319.20
Intel OverDrive Pentium 160MHz upg for 5/100	456.23

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NEW!

NASDAQ

BUY WITH CONFIDENCE
CDW® IS A NASDAQ
TRADED COMPANY
TICKER SYMBOL CDWC
D & B rated SA1
Duns 10-762-7952

Byte 1800 10/96

CDW® Computer Centers, Inc. • 1020 E. Lake Cook Road • Buffalo Grove, IL 60089

CDW® TELEPHONE HOURS

Sales
Monday-Friday 7am-9pm CST
Saturday 9am-6pm CST
Tech Support for Customers
Monday-Friday 8am-9pm CST
Saturday 9am-5pm CST

If you find a better price,
call CDW® before you buy

Fax: 847-465-6800
Sales: 800-959-4239 (4CDW)



SMARTCACHE[®] IV

SMARTRAID[®] IV

We Wrote the Book On RAID.



Check Out Our Latest Editions

Communications Week called our SmartCache IV card with its optional RAID/Caching Module attached "...one of the fastest SCSI adapters we've ever tested." And our performance doesn't stop there. The new SmartRAID IV high performance ULTRA SCSI RAID adapters offer an **even faster** processor, and your choice of one, two or three SCSI bus configurations. Maybe that's why SmartRAID IV adapters have been chosen by major computer manufacturers around the world as the standard RAID offering in their high-end servers.

Key features of DPT RAID adapters include:

- Hardware RAID 0, 1 and 5
- Support for up to 64MB of cache
- Powerful on-board processors for best performance
- **SmartCorrect**, DPT's exclusive error correcting technology
- Storage Manager software for easy RAID setup and maintenance

Call us today for more information on DPT RAID products. Mention the key code at the bottom of this ad and we'll also send you a copy of our latest book on RAID entitled "**RAID and SCSI Technology Papers.**"

See for yourself why we say: SmartCache, SmartRAID, Smart Choice!

1-800-860-4589

DPT
Distributed Processing Technology



B9610

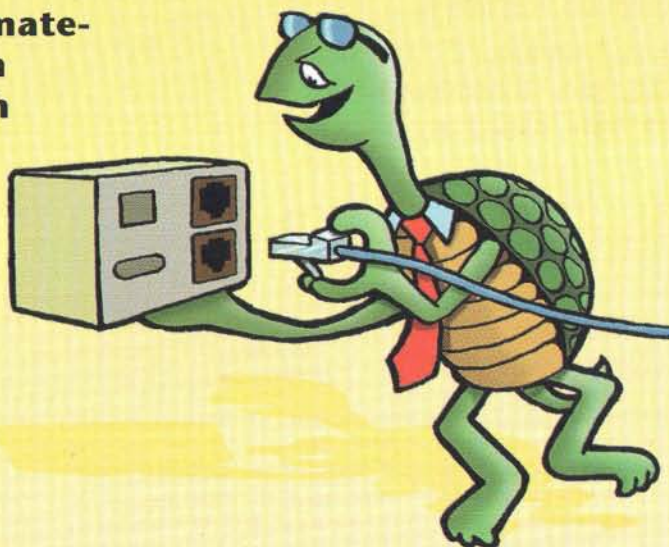
COMDEX
BOOTH NUMBER
L2762



Circle 200 on Inquiry Card.

Operating Your PC up to 300 Feet Away is a SNAP!

- **Locate your keyboard, monitor and PS/2 mouse up to 300 feet away from your computer**
- **Uses two Category 5 UTP cables for lower installation cost**
- **Works with PC, PC/XT, PC/AT, PS/2 and 100% compatibles**
- **Keep your PC in a secure, climate-controlled area and maintain access from crowded or harsh environments**
- **Supports up to 1024 x 768 non-interlaced resolution**



COME SEE US AT
Networks Expo in Dallas, TX Oct. 29-31 Booth #1591
COMDEX/Fall '96 in Las Vegas NV, Nov. 18-22 at Booth #L4254

S N A P
PC EXTENDER



Cybex Computer Products Corporation
4912 Research Drive Huntsville, AL 35805 USA
(205) 430-4000 (205) 430-4030 fax
<http://www.cybex.com/>



Cybex and Extender are trademarks of Cybex Computer Products Corporation. PC, PC/XT, PC/AT, and PS/2 are registered trademarks of International Business Machines Corporation. The Inc. 500 logo is a registered trademark of Goldhirsh Group, Inc.

Dealer Program Available

Made in USA

Diagnose any PC's problems fast with

the **UNIVERSAL DIAGNOSTICS TOOLKIT**™



- **Get the best, most accurate full-system diagnostics package for all your problem PCs.**
- **Low-Level Formats all hard drives including IDEs. Allows relocation of Track 0.**
- **Works with any PC regardless of O/S: DOS, Windows 95 & NT, O/S2, Unix, Novell, etc.**

Loop-back Plugs—
9-pin serial, 25-pin serial
and 25-pin parallel
plugs, used for external
I/O port testing.

2 Micro-Scope floppy disks—
containing the best
PC diagnostic tools
on the market.
Comes with both 3.5"
and 5.25" disks to
work with any PC.

Micro-Scope 6.1™

UNIVERSAL DIAGNOSTIC SOFTWARE

**Fully O/S independent
diagnostic software...**

*Call for upgrade pricing &
complete new features list!*

MICRO-SCOPE Universal Computer Diagnostics was developed to satisfy the expanding need for accurate system diagnosis in the rapidly growing desktop computer market. Patterned after super-mini and mainframe diagnostic routines, **MICRO-SCOPE** runs independently of any standard operating system, and is therefore at home on any machine in the Intel world. Speed, ease-of-use, and razor sharp **ACCURACY** are a few of the advantages that arise from this system independence. **Jerry Pournelle** awarded **MICRO-SCOPE & POST-PROBE** the User's Choice Award in the May 1994 issue of Byte Magazine, saying: **"You name it, this tests it. If you maintain PCs you'll love it."**

♦ **LOW-LEVEL FORMAT**—Performs low-level format on all hard drives including IDE drives. ♦ **TRUE HARDWARE DIAGNOSTICS**—Accurate testing of CPU, IRQ's, DMA's, memory, hard drives, floppy drives, video cards, etc. ♦ **RELOCATES TRACK 0** on hard drives that support relocation. ♦ **IRQ CHECK**—Talks directly to hardware and shows I/O address and IRQ of devices that respond. ♦ **O/S INDEPENDENT**—Does not rely on O/S for diagnostics. Talks to PC at hardware level. All tests are full function regardless of O/S (i.e. Windows, Novell, UNIX, O/S2). ♦ **IRQ DISPLAY**—Show bits enabled in IRQ chip for finding cards that are software driven (Network, Sound Card, etc.). ♦ **MEMORY DISPLAY**—Displays any physical bit of memory under 1 MB. Very useful for determining memory conflicts and available memory space. ♦ **AND MUCH MORE...** We don't have enough space here for everything this software can do!

Govt. Orders: NSN-7030-01-421-6459

Call Now for Special Pricing
1-800-864-8008

**MICRO
2000**™



**Windows 95
COMPATIBLE**



Complete Micro-Scope Manual— easy to follow testing procedures and detailed error code descriptions. See the features list at left to view some of the incredible wealth of testing capabilities this program contains.

100% accurate results...

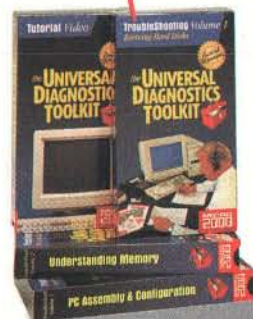
Tri-State Logic Probe—works with Post-Probe and enables testing down to individual chip level.

Durable Zip-up Leatherette Carrying Case—all your tools in one organized easy to carry toolkit.

Post-Probe Diagnostic Card—when Post-Probe detects an error, a 2 digit BIOS code will display on the card telling you exactly what's wrong with your PC. 100% compatible with all ISA, EISA, Compaq and Micro-Channel PCs.

Micro-Channel Adapter Card—(behind Post-Probe card) allows Post-Probe to be used with Micro-Channel equipped computers.

NEW Optional Tutorial and PC Trouble Shooting Videos—Call for titles and current prices. A wealth of technical help at your fingertips.



Post-Probe™

First Ever Universal P.O.S.T. Card for All PCs!



PC won't boot up? Find out why fast with our universal POST card...

"This is the only card that will function in every system on the market. The documentation is extensive, and not only covers the expected POST Codes for different BIOS versions, but also includes a detailed reference to the bus signals monitored by the card." —**Scott Mueller** from his globally recognized book, *'Upgrading & Repairing PCs, Second Edition'*

- ◆ Includes pads for voltmeter to attach for actual voltage testing under load.
- ◆ 4 LEDs monitor +5vdc -5vdc +12vdc -12vdc. ◆ Monitors Hi & Lo clock and OSC cycles to distinguish between clock chip or crystal failure. ◆ Monitors I/O Write and I/O Read to distinguish between write and read errors. ◆ Accurately monitors progress of POST for computers *without* POST codes. ◆ Reads POST codes from any IBM or compatible that emits POST codes. ISA/EISA/MCA.
- ◆ Compatible with Micro Channel computers. ◆ Dip switch allows easy selection of I/O ports to read. ◆ Includes **TRI-STATE LOGIC PROBE** to determine actual chip failures. ◆ Manual includes chip layouts and detailed POST procedures for all major BIOSs. ◆ **AND MUCH MORE...** call for more details.

Govt. Orders: NSN-7025-01-421-6467

Micro 2000, Inc. *Makers of Professional PC Diagnostic Tools*
 1100 East Broadway, Suite 301, Glendale, California, USA 91205
 Toll Free: 800/864-8008 • Phone: 818/547-0125 • Fax: 818/547-0397
Web Site: <http://www.micro2000.com>
 International Orders please call:
 Micro 2000 Australia.....61-42-574-144
 Micro 2000 UK.....44-1462-483-483
 Micro 2000 Amsterdam.....31-206-384-433
 Micro 2000 Germany.....49-69-420-8278

Extensive Post-Probe Manual—exhaustively complete, containing BIOS error codes for most PCs on the market. Look up the 2-digit error code in this manual and instantly diagnose your PC's problem. Also contains common chip diagrams, descriptions and complete troubleshooting tips.



Reliable and Affordable Ethernet Networking Products!

EtherPRO III Series

10BASE-T/BNC Adapter Card features Plug 'N Play I/O, interrupt and PROM address. NE2000/IEEE802.3 compliant with LED indicators for activity and link detection. Supports NOVELL, Microsoft, Artisoft, FTP and PC/NFS. Compatible with all Bus systems, 10Mbps transfer and is FCC certified.

Configuration options:

- Plug 'N Play Design -I/O 300h,320h,340h & 360h
-Interrupt 2,3,4,5,10,12,15

AE-200JL-N	10BaseT/BNC Adap.	\$39
AEF-380PCI	PCI 10BaseT Adap.	\$9
AEF-350TX	PCI 10BaseT 10/100 Adap.	\$9
UTP16/L	16 Port 10BaseT Hub	\$227
UTP8SL	8 Port 10BaseT Hub	\$96



16-Port 10BASET Concentrator

- Reliable
- Compact
- Cost-effective!



Offers Sixteen 10BaseT ports with RJ45 connectors, One BNC and One AUI port for cascading hubs or connection to existing backbone, has 21 LED indicators for confirming status and operations. IEEE802.3 compliant.

BEN220 BOCAHUB-16 PLUS 10Base-T Concentrator \$247
BEN210 BOCAHUB-8 (Eight Port) 10Base-T Concentrator \$99

Non-Powered Parallel Line Extender

PLE100 DB25 Male to DB25 Male, 30' Cable \$43 PLE110 DB25 Male to 36P Male, 30' Cable \$43

1-800-531-5369
FAX: 210-637-3264

Hard Drives Seagate

ST51270A
1.28Gb, IDE, 10.5ms \$225
ST32140A
2Gb, IDE ATA-2, 10ms \$10
MXT-72004A Maxtor
2Gb, IDE ATA-2, \$289

MITSUMI 8XCDROM Drive

- 1200Kbps data transfer
 - 256K Built-in Buffer memory
 - Compatible with 16-bit enhanced IDE/ATAPI interface
 - Motorized front disc loading/auto eject
 - MPC3 compliant
- FX-800 \$129

36.6Kbps Modems

V.34i ZOOM 36.6Kbps
Internal Send/
Receive Fax
Modem \$109



SPORT-28.8E
US ROBOTICS
36.6Kbps
External \$189

SPORT-28.8i
36.6Kbps
Internal \$169



Texas Locations

800-531-5369

San Antonio, TX
10731 Gulfdale

(210) 828-0503 • FAX: (210) 340-2409

Austin, TX

10705 Metric Blvd.

(512) 832-9131 • FAX: (512) 835-1328

Dallas, TX

15207 Midway Rd

(214) 386-8882 • FAX: (214) 386-9182

Corpus Christi, TX

2650 S.P.I.D.

(512) 814-8882 • FAX: (512) 814-8812

San Antonio, TX

11342 IH-35 North

(210) 637-3200 • FAX: (210) 637-3264

Category 5

(UTP) Unshielded

Twisted Pair

VDC5-4

Level 5, 4 Pair, Unshielded

CL-2 PVC

1-99' 100-999' 1000'

\$0.15 \$0.10 \$90

VDC5-4P

Level 5, 4 Pair, Plenum

1-99' 100-999' 1000'

\$0.45 \$0.30 \$257

MP-8S

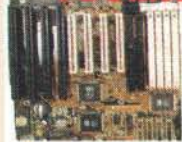
Modular Plug, 8 pin for 24

AWG Solid Wire

1-99 100-999 1000+

\$0.38 \$0.30 \$0.25

100MHz PENTIUM MOTHERBOARD



Supports Intel Pentium processors 75 to 166MHz. AMI Plug 'n Play Flash BIOS, clock generator for fast speed changes and meets EPA EnergyStar Standards.

- 256KB cache
- Four 72-pin SIMM sockets support EDO with up to 128Mb.
- Built-In Controller support 4 IDE drives (up to 16.6MBps transfer)
- Features 4 PCI Master & 4 ISA Slots
- Integrated I/O features EPP/ECP bi-directional parallel port.
- Two 16550 UART Serial ports with 16 byte FIFO, LBA IDE drive support over 528Mb

MBPEN-100

PREMIO Pentium Motherboard 100MHz CPU

MBPEN-133

PREMIO Pentium Motherboard 133MHz CPU

MBDX4P100A

486 DX4 "Green", PCI Mainboard with 120MHz AMD CPU



\$299
459
169

IEEE 1284 Enhanced Parallel (EPP) Printer Cables

Bi-Directional Printer Cables

PPC1284-6 DB25 Male to Centronics 36P Male (6 ft)
PPC1284-10 DB25 Male to Centronics 36P Male (10 ft)

Each
\$12.95
15.95

Cable Assemblies (Premium Fully Shielded)

Part#	Description	Each	10+
5MM-6	5-Pin Din M-M, 6 ft.	\$2.99	\$2.54
PPC301-6	Printer Cable DB25-36 Pin Centronics, 6ft.	2.99	2.54
25MM-6	DB25, 25 Line Cable Male to Male, 6 ft.	3.99	3.51
25MF-6	DB25, 25 Line Cable Male to Female, 6 ft.	3.99	3.51
HD15MM-6	15 Pin High Density, Male to Male, 6 ft.	4.99	4.24
KEC-6	AT Keyboard Extension Cable, 6 ft.	2.99	2.54
PS2KEC-6	PS2 Keyboard Extension Cable, 6 ft.	3.39	2.99
MEC-6	AT Monitor Extension Cable, (9M-9F) 6 ft.	2.99	2.54
PS2MEC-6	PS2 Monitor Extension Cable, 6 ft.	3.39	2.99
ATM-6	AT to Modem, 6 ft. (9S-25P)	2.99	2.60

Check Out
Our Home
Page

http://
www.altex.com



PPC301-6

Reliable, Efficient Tape Storage Allows You Portable Security & Peace of Mind!

IOMEGA "ZIP" 100MB Drive

Allows you quick storage on the go! Great for software applications, presentations, financials, spreadsheets and more. Features 1.25Mbps Data Transfer with 29ms access time, ZIPTool Software allowing you to organize, track and locate files fast and effectively. Weighs less than a pound and fits in palm. Compatible with DOS, Windows 95 or Mac7.



ZIP-100P	IOMEGA ZIP 100Mb Parallel Port for PC/Notebooks	\$209
ZIP-100S	IOMEGA ZIP 100Mb SCSI Port for PC	199
ZIP-C3	100Mb ZIP PC Cartridges (Three)	52.95
ZIPC10	100Mb ZIP PC Cartridges (Ten)	149.95
ZIP100CF	SONY 100Mb Capacity Cartridge	15.95



Since
1980



Computers & Electronics

Hours 7:30am-6:30pm M-F • 9-5pm Sat CST

CORPORATE, INSTITUTIONAL & GOVERNMENT PDS WELCOME. NET 30 TERMS AVAILABLE UPON APPROVAL

TERMS: For C.O.D. orders add \$5 per package. Minimum \$25. Cash or Cashiers Check only. For orders under \$99 add \$3 handling charge. All shipping is FOB San Antonio, Texas and will be added to your invoice. Texas residents add 7.3/4% sales tax. All returns require RMA# and must be returned in original condition. A 15% restocking fee will be assessed on product returned in non-resaleable condition. Prices subject to change without notice. We are not responsible for typographical errors.



ATEN

Network Server Switch

MASTER VIEW allows one console to access six servers (CPUs). Supports VGA to Multi-sync, has built-in buffer, Daisy Chainable, AutoScan or Manual selection (3-40 sec. scan). Perfect for computer room access to file servers, trouble shooting, testing.

CS-106 AT, 1 to 6 \$279
CS-104 AT/PS2, 1 to 4 \$269
CS-102 AT, 1 to 2 \$219
CS-122 PS2, 1 to 2 \$219
VIDEO SEPARATOR - Video Signal is enhanced for distance up to 210 ft. (Daisy Chainable)
VS-102 2 to 1 \$55
VS-104 4 to 1 \$119
VS-108 8 to 1 \$179

WE WILL TRY TO MATCH OR BEAT ANY ADVERTISED PRICE. CALL FOR LATEST PRICING!!

WE ACCEPT PO'S
FROM QUALIFIED FIRMS

30 DAY
MONEY BACK
GUARANTEE

IBM PS/1, PS/2 MEMORY MODULES

LIFETIME
WARRANTY

SECURITY WILL CALL WINDOW NOW
OPEN! NO SURCHARGE FOR MC,
VISA AE & DISCOVER

HOT BOX SPECIALS

★ THINKPAD SPECIALS ★

Compaq centura 400, 4Meg	\$49.00
4 x 8-80	29.00
4 x 8-70	39.00
Thinkpad 1Meg V-Ram Pl. No. 171017-001	19.00
Thinkpad 750, 720, 700, 360, 355 4Meg	49.00
1 x 1-80, 18 pin chip	2.00
1 x 9-80	12.00
256 x 1-10, 16 pin chip	50.00
Cyrix DRX2, 16-32	69.00
NEC Versa 4Meg	49.00
Panasonic 6500, 1Meg Module	14.00
HP 4P, 5P, 4V, 1Meg	14.00
HP 4, 1Meg	14.00

CACHE MEMORY

	12MS	16MS	20MS	25MS
8048	9.00	4.50	4.25	4.00
3225 (3.3V)	11.00	5.00	4.50	4.00
8048A	11.00	5.00	4.50	4.00
8048A (5V)	11.00	5.00	4.50	4.00
18K4	8.00	7.00	6.00	5.00
1724	12.00	11.00	10.00	9.00
244	12.00	11.00	10.00	9.00

Individual D-RAM Chips

	5MS	6MS	7MS	8MS	10MS
1Mg/1	8.00	6.00	5.00	4.50	4.00
2Mg/1	14.00	10.00	8.00	7.00	6.00
4Mg/1	24.00	18.00	14.00	12.00	10.00
8Mg/1	44.00	34.00	26.00	22.00	18.00
16Mg/1	74.00	56.00	42.00	36.00	28.00
32Mg/1	124.00	94.00	70.00	60.00	48.00
64M/1	224.00	174.00	130.00	110.00	88.00
128M/1	424.00	324.00	240.00	200.00	160.00
256M/1	824.00	624.00	460.00	380.00	300.00
512M/1	1624.00	1224.00	860.00	700.00	560.00
1Mg/2	16.00	12.00	9.00	8.00	6.00
2Mg/2	32.00	24.00	18.00	16.00	12.00
4Mg/2	64.00	48.00	36.00	32.00	24.00
8Mg/2	128.00	96.00	72.00	64.00	48.00
16Mg/2	256.00	192.00	144.00	128.00	96.00
32Mg/2	512.00	384.00	288.00	256.00	192.00
64Mg/2	1024.00	768.00	576.00	512.00	384.00
128Mg/2	2048.00	1536.00	1152.00	1024.00	768.00
256Mg/2	4096.00	3072.00	2304.00	2048.00	1536.00
512Mg/2	8192.00	6144.00	4608.00	4096.00	3072.00
1Mg/4	16.00	12.00	9.00	8.00	6.00
2Mg/4	32.00	24.00	18.00	16.00	12.00
4Mg/4	64.00	48.00	36.00	32.00	24.00
8Mg/4	128.00	96.00	72.00	64.00	48.00
16Mg/4	256.00	192.00	144.00	128.00	96.00
32Mg/4	512.00	384.00	288.00	256.00	192.00
64Mg/4	1024.00	768.00	576.00	512.00	384.00
128Mg/4	2048.00	1536.00	1152.00	1024.00	768.00
256Mg/4	4096.00	3072.00	2304.00	2048.00	1536.00
512Mg/4	8192.00	6144.00	4608.00	4096.00	3072.00

CYRIX DRX 386 to 486 Upgrade Clock Doubler

CX486 DRX-25/50	199.00	CX486 DRX-33/66	199.00	CX486 SRX-25/50	189.00
-----------------	--------	-----------------	--------	-----------------	--------

SIMM Modules (Add \$5.00 for SIPP)

	40MS	50MS	60MS	70MS	80MS	100MS
1Mg x 9 (1 chip)	16.00	10.00	8.00	7.00	6.00	5.00
1Mg x 9 (2 chips)	32.00	20.00	16.00	14.00	12.00	10.00
2Mg x 9 (2 chips)	64.00	40.00	32.00	28.00	24.00	20.00
4Mg x 9 (2 chips)	128.00	80.00	64.00	56.00	48.00	40.00

72 PIN SIMMS (FPM, EDO)

	60MS	70MS	80MS
256 x 36 1 mg	20.00	19.00	18.00
512 x 36 2 mg	34.00	29.00	19.00
1 meg x 36 4 mg	49.00	49.00	49.00
2 x 36 8 mg	94.00	89.00	89.00
4 x 36 16 mg	144.00	139.00	139.00
8 x 36 32 mg	299.00	279.00	279.00
16 x 36 64 mg	969.00	859.00	859.00
1 x 32 4 mg	39.00	34.00	34.00
2 x 32 8 mg	74.00	69.00	69.00
4 x 32 16 mg	134.00	124.00	124.00
8 x 32 32 mg	249.00	239.00	239.00
16 x 32 64 mg	809.00	799.00	799.00
1 x 32 4 mg EDO	39.00	34.00	34.00
2 x 32 8 mg EDO	74.00	69.00	69.00

RAID

PERFORMANCE



DATA INTEGRITY

Today's applications require higher performance and reliability from your storage configurations. Consan RAID systems are your storage solutions.

We have specialized in mass storage configurations for nine years and Consan designs the highest performing RAID configurations to meet your most demanding needs.

- **HARDWARE+SOFTWARE RAID**S — All Raid levels for all platforms.
- **HOT SWAP** — Optional hot swap drives, power supplies, and fan.
- **DIGITAL VIDEO+CAD** — Digital Video + CAD Approved with most applications.
- **NETWORK SERVERS** — Combining performance and data integrity.

CONSAN builds Seagate based solutions as well as a full line of other disk, tape, optical and CDR storage products. For more information, call Consan toll-free at :

1-800-221-6732.

 **Seagate**

CONSAN

7676 EXECUTIVE DRIVE
EDEN PRAIRIE, MN 55344
TEL: 612-949-0053
FAX: 612-949-0453

1320 TOWER ROAD
SCHAUMBURG, IL 60173
TEL: 847-519-1060
FAX: 847-519-1248

101 EAST PARK BLVD.
PLANO, TX 75074
TEL: 214-422-3392
FAX: 214-422-3397



Circle 206 on Inquiry Card.

Powered By Polywell

For CAD/CAM, Animation, Video Editing, Internet/Intranet, SQL Servers

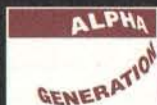


Custom Configuration for
high-end Alpha, Multi-
processor Pentium Pro
Server/Workstations.

PolyRaxx RackMounts
Clustering Disk Array
Portable Alpha, PCs



Optimized for:
Video/Animation Authoring,
Image Editing, Presentation,
CAD/CAM, 3D Rendering,
Internet/Intranet/SQL Server



433MHz (256-bit Alpha 21164A) Super System with 9GB HD
400MHz (256-bit Alpha 21164A) Advanced System with 4.3GB HD
300MHz (256-bit Alpha 21164) Standard System with 2.1GB HD
275MHz (128-bit Alpha 21064A) Basic System with 1.2GB HD

from \$9,995
from \$7,995
from \$4,995
from \$2,995



Quad Pentium Pro 4 x 200MHz SQL Server with 20GB Disk Array
Dual Pentium Pro 2 x 200MHz SMP NT System with 4.3GB HD
Single Pentium Pro 200MHz Standard NT Station with 2GB HD

from \$19,950
from \$4,500
from \$2,500



Pentium 200MHz High-Power PC with 2GB HD
Pentium 166MHz Standard PC with 1.6GB HD
Cyrix P166+ Budget PC with 1.2GB HD

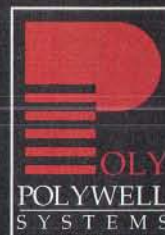
from \$2,300
from \$1,995
from \$1,595

Polywell Computers, Inc (800) 789-8027
www.polywell.com

1461 San Mateo Ave., So. San Francisco, CA 94080, USA
Tel: (415) 583-7222 Fax: (415) 583-1974 E-Mail: info@polywell.com



Warranty and Support
5-year in-house labor,
2-year standard parts,
10-year toll free support
30-day money back guarantee



Circle 203 on Inquiry Card.

Watch the Asia-Pacific's
Networking Leaders
Vie to Solve
REAL-WORLD
Strategic
Issues.

SINGAPORE OCT. 24th • HONG KONG OCT. 29th • SYDNEY OCT. 31st

Two real networks, two real debates on how they should grow.

Here's a common-sense, real-world seminar to help you practically understand the new high-speed LAN, switching, and routing technologies, as well as frame relay, ATM and the new wide-area networking products and strategies.

First you'll get a tutorial on these hot areas from Robin Layland, Data Communications Contributing Editor and experienced networking manager, and Datapro analyst Mitch Radomir, an Asia-Pac expert in internetworking.

Then, you'll be able to compare the products and strategies of the leading Asia-Pacific networking vendors and then watch them solve two real-world networking problems facing a typical campus network and wide area network in the region.

Here's only some of the issues to be addressed:

- How will campus networks evolve over the next three years?
- Will routers be replaced by switches?
- How much bandwidth is needed on the desktop?
- What's the best way to handle voice and data to remote locations?
- Is ATM the answer?
- Is it frame relay that handles both data and voice?
- What role should the internet play?

Register now! Fax to +65-538-4436.

Seating is limited to 200 attendees. For more information call Rosie Lee at

Phone: +65-538-4432 or fax at number above.

**Data Communications and Datapro
The Great Debate on LAN and WAN Strategies**

October 24, 1996

The Sheraton Towers
Singapore
39 Scotts Rd.
Singapore 228230

October 29, 1996

The Grand Hyatt
Hong Kong
1 Harbour Rd.
Hong Kong

October 31, 1996

ANA Hotel Sydney
176 Cumberland St
The Rocks, Sydney
NSW 2000 Australia

Registration Fee: \$150 (U.S. Currency)

- ☐ I'd like to register immediately.
☐ I'm interested, but want more information.

Name _____

Title _____

Organization _____

Address _____

Country _____

Phone _____

Fax _____

Presented
by

Data Communications &
ASIA-PACIFIC

DATAPRO
Information Services
Group

MEMORY UPGRADES



- DISCOUNT PRICES
- HUGE SELECTION
- OVERNIGHT DELIVERY
- FREE SUPPORT FOR FSI CUSTOMERS
- SATISFACTION GUARANTEED
- NO SURCHARGE ON CREDIT CARDS
- CORPORATE PO'S WELCOME
- GOVERNMENT & EDUCATIONAL PRICING

CALL NOW FOR YOUR FREE CATALOG!

Always your best buy on the widest selection of memory upgrades!

DESKTOP COMPUTER MEMORY

COMPAQ

scenrio 425, 433, 633, 655, 660, 800C, 800, 800, 833, 850, 866			
425/433, 425/433, 425/433, 425/433, 425/433, 425/433, 425/433			
425/433, 425/433, 425/433, 425/433, 425/433, 425/433, 425/433			
425/433, 425/433, 425/433, 425/433, 425/433, 425/433, 425/433			
425/433, 425/433, 425/433, 425/433, 425/433, 425/433, 425/433			
425/433, 425/433, 425/433, 425/433, 425/433, 425/433, 425/433			
425/433, 425/433, 425/433, 425/433, 425/433, 425/433, 425/433			
425/433, 425/433, 425/433, 425/433, 425/433, 425/433, 425/433			
425/433, 425/433, 425/433, 425/433, 425/433, 425/433, 425/433			
425/433, 425/433, 425/433, 425/433, 425/433, 425/433, 425/433			

DELL

Power Desktop 486 Models			
486 3102507	\$45	16MB	3102625 \$148
PowerEdge 700, OptiFlex, Dimension XPS, OptiFlex ME 486 & Performance			
486 3103325	\$24	8MB	3104083 \$84
486 3103327	\$130	32MB	n/a \$241
Performance ME, Compaq Pentium ME, OptiFlex DGL, PowerEdge			
58/NEI Models			
8MB 3103335	\$64	16MB	3103336 \$128
32MB 3103337	\$290	64MB	n/a \$462
PowerLine Workstations SE & DE Models			
8MB 3102468	\$90	16MB	3102469 \$164
32MB 3102630	\$294	64MB	3102631 \$470
Dimension XPS & OptiFlex 700/704/704T Pentium Models			
8MB 3102647	\$94	16MB	3103374 \$178
32MB 3103375	\$360	64MB	3103368 \$462

Paragon Memory Corporation

AST COMPUTER

Bravo IC & MS Pentium Models			
8MB 503008.001	\$67	16MB	503008.002 \$133
32MB 503008.003	\$259	64MB	503008.004 \$470
Modeling V & G Models Pentium 4/33, 4/33A, 4/33B, 4/33C, 4/33D, 4/33E, 4/33F, 4/33G, 4/33H, 4/33I, 4/33J, 4/33K, 4/33L, 4/33M, 4/33N, 4/33O, 4/33P, 4/33Q, 4/33R, 4/33S, 4/33T, 4/33U, 4/33V, 4/33W, 4/33X, 4/33Y, 4/33Z			
8MB 501159.002	\$90	16MB	501159.003 \$164
32MB 501159.004	\$290	64MB	501159.005 \$470
Modeling V & G Models Pentium 4/33, 4/33A, 4/33B, 4/33C, 4/33D, 4/33E, 4/33F, 4/33G, 4/33H, 4/33I, 4/33J, 4/33K, 4/33L, 4/33M, 4/33N, 4/33O, 4/33P, 4/33Q, 4/33R, 4/33S, 4/33T, 4/33U, 4/33V, 4/33W, 4/33X, 4/33Y, 4/33Z			
8MB 500987.002	\$34	16MB	500987.003 \$68
16MB 500987.004	\$130	32MB	500987.005 \$260
Modeling V & G Models Pentium 4/33, 4/33A, 4/33B, 4/33C, 4/33D, 4/33E, 4/33F, 4/33G, 4/33H, 4/33I, 4/33J, 4/33K, 4/33L, 4/33M, 4/33N, 4/33O, 4/33P, 4/33Q, 4/33R, 4/33S, 4/33T, 4/33U, 4/33V, 4/33W, 4/33X, 4/33Y, 4/33Z			
8MB 500780.001	\$67	16MB	500780.002 \$133
32MB 500780.003	\$259	64MB	500780.004 \$470

IBM

Active full models & PC 300 Model 330/350			
4MB 9207339	\$84	8MB	9207341 \$168
16MB 9207343	\$320	32MB	9207345 \$640
4MB Video	\$95	8MB	9207351 \$190
256K Cache	\$95	512K	9207351 \$190
VideoPort 6384/6472/6482/6484/6472/6484/6381 ST Models			
4MB 9207331	\$84	8MB	9207333 \$168
16MB 9207343	\$320	32MB	9207345 \$640
PS/ValuePort 6384, PS/1 Consultant/Expert/Expert Models			
4MB 909290	\$85	16MB	909291 \$170
PS/ValuePort 6384/6384A/6387, PS/1			
4MB 6450128	\$64	8MB	6450130 \$128
16MB 9207304	\$130	32MB	9207306 \$260
PC 700 Model 730/6887, Model 730/6877			
8MB 9207318	\$87	16MB	9207320 \$174
32MB 9207322	\$294	64MB	9207324 \$588
PC 700 Model 730/6885/6886, Model 730/6875/6876			
4MB 7303131	\$40	8MB	6450130 \$128
16MB 9207304	\$130	32MB	9207306 \$260
PS/2 25/286, 30/286, 33/286, 40/286, 50/286, 55/286, 60/286, 66/286, 80/286, 90/286, 100/286, 120/286, 133/286, 166/286, 200/286, 233/286, 266/286, 300/286, 333/286, 366/286, 400/286, 450/286, 500/286, 550/286, 600/286, 660/286, 700/286, 750/286, 800/286, 866/286, 900/286, 950/286, 1000/286, 1100/286, 1200/286, 1300/286, 1400/286, 1500/286, 1600/286, 1700/286, 1800/286, 1900/286, 2000/286, 2100/286, 2200/286, 2300/286, 2400/286, 2500/286, 2600/286, 2700/286, 2800/286, 2900/286, 3000/286, 3100/286, 3200/286, 3300/286, 3400/286, 3500/286, 3600/286, 3700/286, 3800/286, 3900/286, 4000/286, 4100/286, 4200/286, 4300/286, 4400/286, 4500/286, 4600/286, 4700/286, 4800/286, 4900/286, 5000/286, 5100/286, 5200/286, 5300/286, 5400/286, 5500/286, 5600/286, 5700/286, 5800/286, 5900/286, 6000/286, 6100/286, 6200/286, 6300/286, 6400/286, 6500/286, 6600/286, 6700/286, 6800/286, 6900/286, 7000/286, 7100/286, 7200/286, 7300/286, 7400/286, 7500/286, 7600/286, 7700/286, 7800/286, 7900/286, 8000/286, 8100/286, 8200/286, 8300/286, 8400/286, 8500/286, 8600/286, 8700/286, 8800/286, 8900/286, 9000/286, 9100/286, 9200/286, 9300/286, 9400/286, 9500/286, 9600/286, 9700/286, 9800/286, 9900/286, 10000/286			
2MB 305360	\$450	4MB	6450068, 6450070 \$89
4MB 347933	\$67	8MB	6450069 \$134
16MB 6450128	\$64	32MB	6450130 \$128
Exposure Boards for PS/2 Systems			
414MB n/a	\$199	414MB n/a	\$199
214MB n/a	\$199	214MB n/a	\$199
414MB n/a	\$199	414MB n/a	\$199

HEWLETT PACKARD

Heinemann & Victor M3 Models			
4MB 02074A	\$45	8MB	02075A \$89
16MB 02076A	\$148	32MB	02079A \$286
Vector 300/300C/300D/300E/300F/300G/300H/300I/300J/300K/300L/300M/300N/300O/300P/300Q/300R/300S/300T/300U/300V/300W/300X/300Y/300Z			
4MB 02090A	\$34	8MB	02091A \$68
16MB n/a	\$130	32MB n/a	\$260
Vector 400 Series			
4MB 02156A	\$45	8MB	02157A \$89
16MB 02076A	\$148	32MB	02079A \$286

digital

DECpc, MTE, & M Models			
4MB 18C7C000	\$45	16MB	18C7C000 \$148
Station & Versant Models			
4MB 18C7C000	\$45	16MB	18C7C000 \$148
16MB 18C7C000	\$148	32MB	18C7C000 \$286
16MB 18C7C000	\$148	32MB	18C7C000 \$286

MICRON

Pro Memory Series & Power Server Series Models			
4MB n/a	\$34	8MB n/a	\$68
16MB n/a	\$130	32MB n/a	\$260
PC Memory Series, Power Station Series & Home APC Series Models			
4MB n/a	\$34	8MB n/a	\$68
16MB n/a	\$130	32MB n/a	\$260

Packard Bell

Executive Series, Force Series & Legend Series Models			
4MB n/a	\$34	8MB n/a	\$68
16MB n/a	\$130	32MB n/a	\$260
16MB n/a	\$130	32MB n/a	\$260

AST COMPUTER

scenrio 800N & 810N Models			
4MB 301488.001	\$79	8MB	301488.002 \$158
16MB 301488.003	\$294	32MB	301488.004 \$588
scenrio 800N & 810N Models			
4MB 301392.001	\$69	8MB	301392.002 \$138
16MB 301392.003	\$191	32MB	301392.004 \$382
scenrio 800N & 810N Models			
4MB 301728.001	\$104	8MB	301728.002 \$208
16MB 301728.003	\$188	32MB	301728.004 \$376
scenrio 800N & 810N Models			
4MB 301984.001	\$87	8MB	301984.002 \$174
16MB 301984.003	\$154	32MB	301984.004 \$308

COMPAQ

scenrio 800N & 810N Models			
4MB 190532.001	\$59	8MB	190532.002 \$118
16MB 190532.003	\$118	32MB	190532.004 \$236
scenrio 800N & 810N Models			
4MB 146553.001	\$53	8MB	146553.002 \$106
16MB 146553.003	\$106	32MB	146553.004 \$212
scenrio 800N & 810N Models			
4MB 146553.001	\$53	8MB	146553.002 \$106
16MB 146553.003	\$106	32MB	146553.004 \$212
scenrio 800N & 810N Models			
4MB 146553.001	\$53	8MB	146553.002 \$106
16MB 146553.003	\$106	32MB	146553.004 \$212

LAPTOP &



Apple Computer

Powerbook 320 & 340 Models			
8MB M19131/A	\$109	16MB	n/a \$229
Powerbook 330 Models			
8MB M37301/A	\$102	16MB	n/a \$199
24MB n/a	\$369	32MB	n/a \$349

DELL

Latitude 433 Models			
4MB 3103385	\$69	16MB	3103386 \$138
Latitude 433E/433F, 433G/433H, 433I, 433J, 433K, 433L, 433M, 433N, 433O, 433P, 433Q, 433R, 433S, 433T, 433U, 433V, 433W, 433X, 433Y, 433Z			
4MB 3103416	\$99	8MB	n/a \$139
16MB 3103417	\$199	32MB	n/a \$399
Latitude XP 450/451/452, XP Pentium Models			
4MB 3103421	\$59	8MB	3103425 \$89
16MB 3103422	\$109	32MB	n/a \$162

digital™

HiNote 486 Models			
4MB FPC73MAA	\$59	8MB	FPC73MAB \$89
16MB FPC73MAC	\$109	32MB	n/a \$162
HiNote Ultra 486 & Ultra V Pentium Models			
4MB FPC73MAA	\$59	8MB	FPC73MAB \$89
16MB FPC73MAC	\$109	32MB	n/a \$162
HiNote V8 Pentium Models			
8MB FPC73MAA	\$109	16MB	FPC73MAB \$209

WINBOOK

WinBook XP XPC Models			
16MB n/a	\$429	32MB	n/a \$609

Windows NT • Solaris • Linux • Windows 95 • OS/2 • PC-DOS • SCO UNIX

Run more than one OS on your PC!



SYSTEM COMMANDER

System Commander makes it safe and easy to add as many OSES to your PC as you want!

Easy Automatic Installation

- Prepares your PC for new OSES in minutes
- Simply select the OS you want and *System Commander* does the rest
- To use another OS simply reboot and make another selection

Money-Saving Flexibility

- Minimize hardware expenses by putting up to 100 OSES on one PC
- Use any combination of hard drives

- Use any Intel compatible OS or combination of OSES, in English or any other language

System Commander is only \$99.95 and comes with an **unconditional 60 day money back guarantee**. Get **Free** overnight shipping when you mention this ad. *Order it now and have it on your desk tomorrow morning!

"System Commander is a blooming miracle"
Jerry Pournelle- **BYTE**

Free overnight shipping* when you mention this ad.

800-648-8266
www.v-com.com

V Communications, Inc.
4320 Stevens Creek Blvd, #120-3BYT
San Jose, CA 95129
408.296.4224 fax 408.296.4441

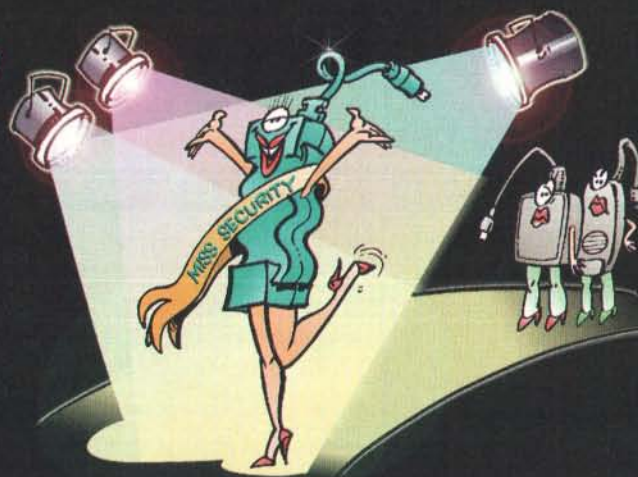
* When ordered before noon PST. No Saturday delivery. Standard shipping outside US. CA res. add \$7.25 sales tax. Offer subject to change without notice. All logos and product names are trademarks of their respective companies. VISA/MC/Amex ©1996

Windows v3.x • DOS/V • Windows 95J • Warp • MS-DOS • Linux • Merlin

Copy Protection

Why use more and more developers **WIBU-KEY** to protect their software against piracy?

- ✓ **Longevity:** You could use a WIBU-BOX from 1989 today with Windows NT, which does not exist 1989! Also you could run old software for DOS today in a DOS box of Windows NT or 95. Each WIBU-BOX is accompanied by a full 3 year warranty.
- ✓ **The most flexible security system for the programmer:** Great Windows interface for programming of WIBU-BOXes and protection of applications, automatic detection of all WIBU-BOX variants with one software, WIBU-BOX for LPT, COM and ADB, transparent and cascable, as PCCard and (E)ISA card. No special, expensive network dongle, the same WIBU-BOX for single stations and usage for a network server. It's one API for DOS, Windows 3.x, 95, NT OS/2, MacOS and networks, independent of the programming language.
- ✓ **The most user-friendly security system for the developer's customer:** The WIBU-BOX is one of the smallest dongles available with an unique design and handling advantage for your customer. A great control panel applet provides easy installation and diagnose tools to your customer. New sales or updates could be handled by "Remote Programming" the WIBU-BOX at your customers PC.
- ✓ **The most secure system:** WIBU-KEY doesn't just do a quick check to see if the dongle is connected - it works by encrypting through our custom ASIC. With top notch security and flexibility. Each encryption in the WIBU-BOX is initialized by a FEAL-8 algorithm (block chiffre, 64 bit key). Over 200 different encryptions could be enabled independently with one WIBU-BOX for selling different applications separately. Additional, each encryption has over 4 billion variants, chosen by a 32 bit selection code.



WIBU-KEY on stage at these next events:

SYSTEMS 96

Munich, Germany
October 21 - 25, 1996
Hall 12, Booth A12

COMDEX

Fall '96 S2031
Sands Expo, Las Vegas
November 18 - 22, 1996



Order your Test-Kit today:
Phone: (800) 986-6578
<http://www.griftech.com>
<http://www.wibu.de>

Providing the highest quality Software Protection since 1989

We are happy to serve you:

Circle 211 on Inquiry Card (Resellers: 212.)

**WIBU
SYSTEMS**

Germany and International:
WIBU-SYSTEMS AG
Rueppurrier Strasse 54 D-76137 Karlsruhe
Tel: +49-721-93172-0 FAX: +49-721-93172-23
BBS +49-721-93172-23 CIS 1001421674
email: info@wibu.de - <http://www.wibu.de>

**GRIFIN
TECHNOLOGIES INC.**

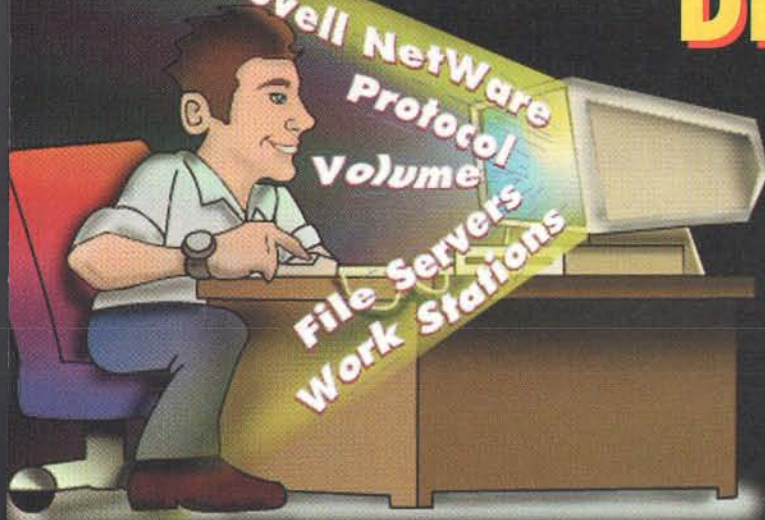
North and South America:
Griffin Technologies Inc.
1617 St. Andrew Dr. Lawrence, KS 66047
Tel: (800) 986-6578 + (913) 832-2070
FAX: (913) 832-8787 CIS 711413624
email: sales@griftech.com - www.griftech.com

Belgium, Lux.: **COMPUSEC** Tel: +32-2-6450944 Fax: +32-2-6464266 info@compusec.be
Croatia: **ARIES D.o.o.** Tel: +385-1-222752 Fax: +385-1-2326535
Estonia: **Lansoft Ltd.** Tel: +372-2-444760 Fax: +372-2-682760 lansoft@infonet.ee
Japan: **Visual Networks Co. Ltd.** Tel: +81-3-34057801 Fax: +81-3-34057818
email: miles-vnet@cyberoz.net
Netherlands: **COMPUSEC** Tel: +31-53-5740223 Fax: +31-53-5726822 info@compusec.be

BECOME A CNE ...FAST!

**THE FIRST CNE COMPUTER
BASED TRAINING PROGRAM
IS HERE...**

Novell NetWare
Protocol
Volume
File Servers
Work Stations



The AllMicro CNE Self-Study Course™ is the first 100% Computer Based Training (CBT) program to fully prepare you for Novell's CNE exams. Its innovative design provides fast, effective and convenient training to anyone wishing to become a Certified NetWare Engineer, even when hampered by a busy schedule. Our CNE CBT allows you to learn and practice everything you'll need for full NetWare certification.

- All on one CD
- Interactive NetWare simulation for hands-on exercises
- Study at your own pace
- Hundreds of practice questions
- Priced below competitive products
- Everything you need to prepare for Novell's test!

Effective!

Through the use of interactive exercises, you'll be able to gain practical hands-on knowledge under simulated situations without the need for a working network.

AllMicro's CNE CBT ensures that when you complete your training you'll be fully prepared to pass your CNE exams, and best of all, you'll be ready and confident to go into the workplace and perform vital CNE functions.

Convenient!

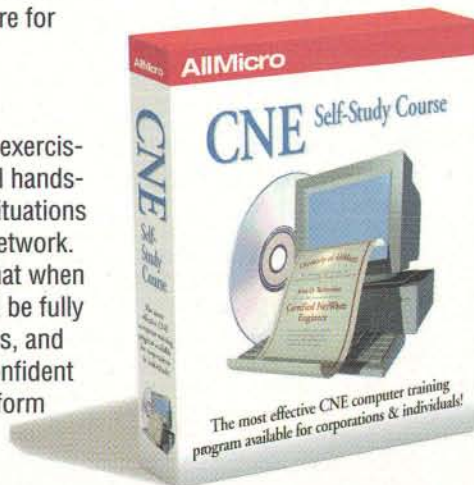
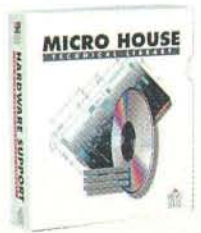
Our CNE CBT program offers you flexibility and portability unmatched by traditional training methods. You will study when and where it's convenient, at your own pace using a step-by-step format for either NetWare 3.1x or 4.1!

Affordable!

The AllMicro CNE Self-Study Course is priced far below other competitive training packages, so you can now get top quality training at a price you can easily afford.

Added Bonus!

The AllMicro CNE Self-Study Course even comes with the required Micro House Technical Library™. You'll have at your fingertips the latest specifications, diagrams, hardware settings, component locations, configurations, and other hardware technical information, all on CD-ROM. Familiarity with the Technical Library is required for full certification.



Don't put your career on hold any longer! Get the AllMicro CNE Self-Study Course and get certified...FAST!

COURSE MODULES INCLUDE:

- Administration v3.1x
- Advanced Administration v3.1x
- 3.1x Installation & Configuration (#802)
- Service & Support for NetWare (#801)
- TCP/IP Transport for NetWare
- Networking Technologies
- NetWare 3.1x to 4.1 Update
- *NetWare 4.1 course also available

NOTE: As of 6/30/96 current CNE's will lose their certification unless they pass Novell's new 3.1x-4.1 update test. We have the course!

CALL TODAY!!

For more information about our limited time discount pricing CALL: **1-800-653-4933**

INTERNATIONAL: (813) 539-7283 • FAX (813) 531-0200

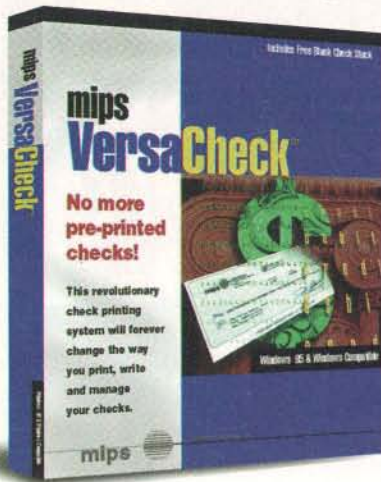
FOREFRONT/AllMicro

18820 U.S. HWY. 19N., #215, CLEARWATER, FL 34624

Circle 208 on Inquiry Card.

BM

No more pre-printed checks!



Save time and money printing your own checks with mips VersaCheck™!

Revolutionary mips VersaCheck™ is the inexpensive software that not only lets you print your own checks from scratch, but automatically keeps your account balances too! mips VersaCheck installs into Word for Windows and lets you create checks in minutes. Include addresses, logos, even your signature, all password protected. **mips VersaCheck even prints the MICR account number required by all banks for processing.** And, you can make changes to your checks at any time, instantly!

- ✓ Print checks for as little as **2.7 cents per check!**
- ✓ Prints bank drafts and deposit slips
- ✓ Business and personal size checks
- ✓ Manage an unlimited number of password-protected accounts
- ✓ Compatible with inkjets and laser printers
- ✓ Compatible with Quicken, QuickBooks, PeachTree and more

Call mips at (800) 898-8560

Also available
through:

TigerSoftware
800-888-4437

PC Mini
800-555-MALL

MicroWAREHOUSE™
800-367-7080

mips



Dataline America, Inc.

Tel: 619-679-4070 Fax: 619-679-4073
13240 Evening Creek Drive, Suite 311 • San Diego, CA 92128

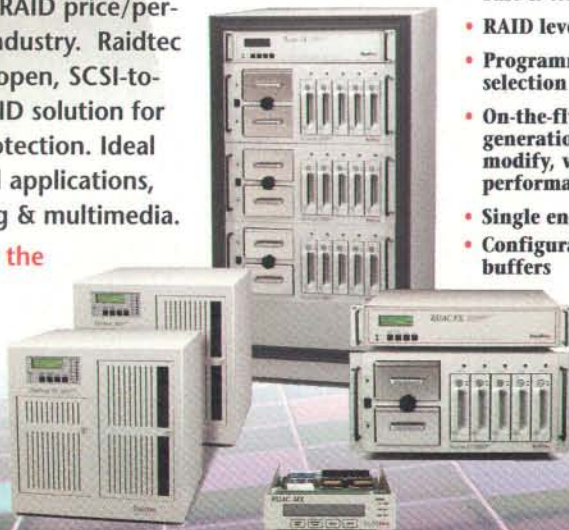
RECOMMENDED BY
 **HEWLETT
PACKARD**

Defacto RAID

High-Performance SCSI RAID Systems

Discover the best RAID price/performance in the industry. Raidtec is the affordable, open, SCSI-to-SCSI hardware RAID solution for complete data protection. Ideal for mission critical applications, document imaging & multimedia.

It's time to re-visit the ultimate in high-availability storage. Contact Raidtec today at (770) 664-6066.



- Fast & Wide SCSI II
- RAID levels 0, 1, 10, 3/5
- Programmable RAID Level selection
- On-the-fly hardware parity generation eliminates read, modify, write-back performance overhead
- Single ended or differential
- Configurable read & write buffers
- Rackable, stackable
- Downloadable flash firmware
- Remote alarms, configuration & monitoring
- Environmental sensor ports
- "Hot Replaceable" disk drive bays & power supplies
- Single SCSI ID
- Solid state load sharing power subsystem
- LCD control panel status display

THE STANDARD IN ADVANCED MASS STORAGE SYSTEMS

Raidtec USA
105 Hembree Park Dr. • Suite C
Roswell, GA 30076
Tel: (770) 664-6066
FAX: (770) 664-6166

Raidtec EUROPE
Glen Mervyn House • Glanmire
Cork, Ireland
Tel.: (353) 21-821454
FAX: (353) 21-821654

Raidtec
CORPORATION

IBM

ThinkPad Notebooks

Thinkpad 365 Systems

Thinkpad 365X	P100	8/810MB, PASSIVE	.. \$Stock
Thinkpad 365XD	P100	8/810MB, PASSIVE, CD	.. \$Stock
Thinkpad 365X	P100	8/810MB, PASSIVE	.. \$Stock
Thinkpad 365XD	P120	8/1GB, PASSIVE, CD	.. \$Stock
Thinkpad 365XD	P120	8/1GB, ACTIVE CD	.. \$Stock
Thinkpad 365E	586/100	8/540MB, PASSIVE	.. \$Stock
Thinkpad 365E	586/100	8/540MB, PASSIVE, CD	.. \$Stock

Thinkpad 760 Systems

Thinkpad 760E	P133	16/1GB, ACTIVE	.. \$Stock
Thinkpad 760ED	P133	16/1.2GB, ACTIVE, CD	.. \$Stock
Thinkpad 760E	P120	16/1.2GB, ACTIVE	.. \$Stock
Thinkpad 760E	P120	8/810MB, ACTIVE	.. \$Stock
Thinkpad 760EL	P100	8/810MB, PASSIVE	.. \$CALL
Thinkpad 760ELD	P100	8/810MB, PASSIVE, CD	.. \$CALL
Thinkpad 760EL	P120	8/810MB, PASSIVE, CD	.. \$CALL
Thinkpad 760EL	P120	8/1GB, PASSIVE, CD	.. \$CALL
Thinkpad 760EL	P120	8/1GB, PASSIVE, CD	.. \$CALL

FOR ALL DESKTOPS & SERVERS PLEASE CALL

Call us before you buy IBM

NOVELL

Network 3.12/4.1 Promotion
5/10/25/50/100/250 USERS

RED or WHITE BOX

call for best price

★ free network card with Purchase over \$2500.00 ★

Visit Our Web Site
www.computerlane.com

HEWLETT PACKARD

Printers

HP DESKJET 340	.. \$295
HP DESKJET 600/660C	.. \$289/392
HP DESKJET 850C/1600C	.. \$495/call
HP LASERJET 5L/5P	.. \$485/call
HP LASERJET 4+/4M+	.. \$1340/1845
HP LASER 4V/4MV	.. \$1840/call
HP SCANJET 4S/4C	.. \$call/892
HP LASER 5SI/5SIMX	.. \$call
HP LASERJET 4+	.. \$1045
HP LASERJET 5/5M	.. \$1265/1699

COMPUTERS

VECTRA XU SYSTEMS

XU 6/150 16/1GBscsi+CD+Matrox	.. \$stock
XU 6/150 16/2GBscsi+CD+Matrox	.. \$stock
XU 6/200 16/1GBscsi+CD+Matrox	.. \$stock
XU 6/200 32/2GBscsi+CD+Matrox	.. \$stock

built in Network card, Windows NT preloaded

HP NETSERVER

Netserver LC P/100/133/166 32/1gb+CD	.. \$call
Netserver LC P/133/166 32/1gb+CD	.. \$call
Netserver LH P/133/166 32mb, no disk, Array	.. \$call
Netserver LH P/133/166 32mb, no disk	.. \$call
Netserver LH P/133/166 64mb, 4.2gb, Array	.. \$call

*** call for all other Netserver configuration ***

HP VECTRA 500 COMPUTERS

515MCX 5/133 16/1.6 GB	+cd+sound+phone .. \$stock
515MCX 5/166 16/1.6 GB	+cd+sound+phone .. \$stock

answering+headphones

Authorized Dealer & Service Center

COMPAQ, IBM, TOSHIBA, HEWLETT PACKARD

COMPAQ

Notebook Systems

Armada Notebook Systems

Armada 1120	P100	8/810MB, Passive	.. \$1799
Armada 1120	P100	8/810MB, Active	.. \$2175
Armada 4110	P100	8/810MB, Passive	.. \$2450
Armada 4110D	P100	8/810MB, PassiveCD	.. \$2799
Armada 4120	P120	8/810MB, Passive	.. \$2999
Armada 4120T	P120	8/810MB, Active	.. \$3650
Armada 4130T	P133	8/1GB, Active	.. \$4298

LTE Notebook Systems

LTE 5150	P/75	8/810MB, Active	.. \$stock
LTE 5250	P/100	8/810MB, Active	.. \$stock
LTE 5250	P/120	16/1.3GB, Active	.. \$stock
LTE 5280	P/133	16/1.3GB, Active	.. \$stock

Deskpro 2000/4000/6000 Systems

Deskpro 2000	p/100, 8/1.2gb	.. \$1275
Deskpro 2000	p/133, 16/1.2gb	.. \$1675
Deskpro 2000	p/166, 16/2.5gb	.. \$2175
Deskpro 2000	6/200, 16/2.5gb	.. \$2690
Deskpro 2000	6/200cd, 32/2.5gb	.. \$3299
Deskpro 4000	6/200, 32/2.5gb, cd	.. \$2799
Deskpro 4000	5/120, 8/1gb	.. \$1599
Deskpro 6000	5/166, 8/1gb, cds	.. \$call
Deskpro 6000	6/200, 32/2.5gb, cd	.. \$1275

Compaq Server

Prosignia 300 Pentium 90,120,150Mhz	.. \$stock
Prosignia 500 Pentium 120,150Mhz	.. \$stock
Prolinat 5000 6/166 Model1	.. \$stock
Prolinat 5000 6/166 Model1A	.. \$stock
Prolinat 5000 6/200 Model2	.. \$stock
Prolinat 5000 6/200 Model2A	.. \$stock
Prolinat 5000 6/166 (rackmount Models)	.. \$stock
Prolinat 5000 6/200 (rackmount Models)	.. \$stock

TOSHIBA

T2110CS	DX4/75	4/330MB	.. \$stock
T2130CS	DX4/75	8/540MB	.. \$stock
T2150CDS	DX4/75	4/540MB+CD+SOUND	.. \$stock
T2150CDT	DX4/75	8/540MB+CD+SOUND	.. \$stock
T2150CDT	DX4/75	4/540MB+CD+SOUND	.. \$stock
T100CS	P/75	8/810MB	.. \$stock
T400CDT	P/75	8/810MB+CD	.. \$stock
T410CDT	P/90	8/810MB+CD	.. \$stock
T700CT	P/120	8/1.3GB	.. \$stock
T710CDT	P/133	16/1.3GB+CD	.. \$stock
T720CDT	P/133	16/1.3GB+CD	.. \$stock

NEW RELEASE

T110CS	P/100	8/810MB	.. \$call
T110CT	P/100	8/810MB	.. \$call
T420CDS	P/100	8/810MB+CD+SOUND	.. \$call
T420CDT	P/100	8/1.3GB+CD+SOUND	.. \$call
T500CDT	P/20	16/1.3GB+CD+SOUND	.. \$call

Also carry Toshiba
Refurbished Models
* Call for Price *

Notebook Specials

Texas Instruments

Extensa 510 P/100 8/810mb passive	.. \$1899
Extensa 560CDT P/75 8/810MB,active	.. \$3099
Extensa 570CDT P/100 8/1.2GB,active	.. \$3384

NEC

Versa 2200c P/75 8/810mb active	.. \$2250
---------------------------------	-----------

Vecra 6000h P/100 16/1.08gb active	.. \$4250
------------------------------------	-----------

Modem Special

U.S. Robotics 28.8 phone answering	.. \$179
------------------------------------	----------

U.S. Robotics 28.8 Win Modem	.. \$135
------------------------------	----------

Motorola Bitsurfer ISDN	.. \$259
-------------------------	----------

Video Boards

Matrox 2/4MB Millenium 3D	.. \$289/429
---------------------------	--------------

Diamond Stealth 3D 2MB	.. \$160
------------------------	----------

Imagine 128 8MB Pro PCI	.. \$1285
-------------------------	-----------

Imagine 128 2MB	.. \$299
-----------------	----------

ACS Computer Specials

ACS P/166 MTC

PCI Intel Triton Chipset

512kb Pipeline cache 32MB Ram

1.44mb floppy drive 2GB IDE hard drive

Matrox 2MB 3D 1600x1200 Video card

8xCD Rom Drive (Toshiba)

Sound blaster AW32 (3D sound)

Mid Tower Case

115 watts speakers system

Fujitsu 101 Enhanced quite wings keyboard

Windows 95 (original with CD)

DOS 6.22 (original with disks)

Mag DX 1795 SVGA Monitor 17"

\$2,650.00

Networking

3cam 3c5009 combo NIC	.. \$119
-----------------------	----------

3cam 3c509b	.. \$105
-------------	----------

Lampro Ne2000 compatible.45	.. \$29
-----------------------------	---------

NE2000 (microdyne)	.. \$69
--------------------	---------

3com linkbuilder hub 8/24/48 port	.. \$call
-----------------------------------	-----------

Motherboards

Azus Pentium M/B+256	.. \$205
----------------------	----------

pipeline BC	.. \$129
-------------	----------

Ampton Pentium M/B+256	.. \$129
------------------------	----------

pipeline BC	.. \$199
-------------	----------

Intel Zepa Pentium M/B+256	.. \$call
----------------------------	-----------

pipeline BC	.. \$call
-------------	-----------

Intel Endeavor Pentium M/B+sound	.. \$call
----------------------------------	-----------

Intel Aurora M/B with Orion	.. \$call
-----------------------------	-----------

Controllers

Adaptec 2940 w/kit	.. \$250
--------------------	----------

Asaptec 1542 w/kit	.. \$250
--------------------	----------

Adaptec 2940UW w/kit	.. \$310
----------------------	----------

*** call for other scsi models ***

Academic Software

Microsoft Academic Partner

Microsoft Office Professional
for windows 95

\$165

MS WINDOWS NT 3.51 SERVER	.. \$345
---------------------------	----------

Ms Win NT workstation	.. \$99
-----------------------	---------

Ms Backoffice Server	.. \$1074
----------------------	-----------

Ms SQL Server	.. \$770
---------------	----------

call for other Microsoft Academic Prices

Computerlane Inc.

Outside California: 1-800-526-3482

Inside California: 818-884-8644 • Fax: 818-884-8253

comlane@instanet.com

7500 Topanga Cyn Blvd., Canoga Park, CA 91303

Hours: Monday - Friday 9-6, Saturday 10-5

Compaq is A Registered
Trademark of Compaq. IBM
is A Registered Trademark
of International Business
Machines. All Quoted
Prices Reflect A 5% Cash
Discount. VISA, Master-
Card, Wire Transfer Also
Accepted. Prices Subject
to Change Without Notice.

..... UNIX™ on NT?



OPENNT™ for Microsoft **WINDOWS NT™**

Softway Systems is the leading provider of standards-based open systems tools for Microsoft® Windows NT™. The OPENNT™ product family consists of a fully conformant POSIX.1 / POSIX.2 runtime and development environment for NT and a host of complementary system products. In the coming months, we will be expanding our product line to provide a fully conformant UNIX operating system environment for Windows NT. OPENNT includes all of the components that users and developers demand on UNIX systems — now available for the first time as a native, fully integrated environment for Windows NT.

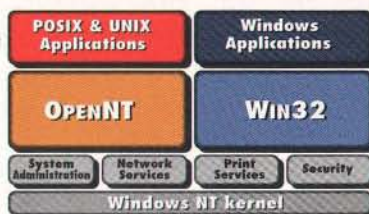
1-800-GET-UNIX

185 Berry St., Suite 5514, San Francisco, CA 94107
Tel.: (415) 896-0708 • Fax: (415) 896-0709 • Sales Toll Free: 800-438-8649
Email: opennt@softway.com • WWW: <http://www.softway.com/OPENNT>

Softway
Systems

OPENNT is a trademark of Softway Systems, Inc. This product includes software developed by the University of California, Berkeley and its contributors. All other registered trademarks and trademarks are the property of their respective owners.

Now you can have the advantages of a UNIX system while running Microsoft's most robust Windows operating system — truly the best of both worlds!



Take advantage of our special offer. Buy any OPENNT product and get one year of product updates for free. Add to this our 30-day "no questions asked" money-back guarantee, low price and free technical support and you have a deal that can't be beat.

For the latest info on OPENNT visit our web site at:
<http://www.softway.com/OPENNT> or call 1-800-GET-UNIX!

- **OPENNT Commands & Utilities** \$199
UNIX-style shell and utilities. All your favorite tools including ksh, awk, grep, sed, vi and more!
- **OPENNT Software Development Kit** only \$99
Development system for porting & developing POSIX and UNIX applications to Windows NT
- **OPENNT X11 Server** \$199
Competitively-priced, high performance X11R6 display server for Windows NT and Windows 95
- **OPENNT Telnet Server** from \$99
Multiuser telnet daemon service for Windows NT.

Lose 500 pounds in 10 minutes

with a Rose keyboard monitor switch

Call today for free catalog

- ◆ Print servers
- ◆ Data switches
- ◆ Keyboard/video control

800-333-9343

Streamline your computer room by reducing excess equipment. Access up to 256 CPU's from a single keyboard, monitor, and mouse. ServeView is our best-selling switch, has every feature you can imagine, and installs in minutes. Compare price, features, performance, quality, and support and you'll find Rose can't be beat. Call us to discuss your application or to receive your free information kit.

Come See Us at
Strictly Business, Oct. 16-17
Houston, TX, Booth #116 *and*
Tech & Learning, Oct. 23-25
Dallas, TX, Booth #802 *and*
Networks Expo, Oct. 29-31
Dallas, TX, Booth #1579

P.O. Box 742571 ◆ HOUSTON, TEXAS 77274
TEL 713/933-7673 ◆ FAX 713/933-0044

ROSE
ELECTRONICS

Supervisor Matrix

Ask for our
Dealer Program!

Simultaneously manage up to 8 computers from up to 16 locations!



- Control with keyboard and control panel
- Scanning function • Lock access to a CPU
- File transfer function as option • Automatic booting of keyboard and mouse • Supporting high-resolution monitors • Customization always available • Rack mountable • 1 year warranty

Variable configurations available: any combination from 1 user to 2 computers up to 16 users to 8 computers



Minicom - CONNECTIVITY SOLUTIONS

Advanced Systems Ltd.

International Headquarters:

11 Beit Hadfus St.

95483 Jerusalem, Israel

Phone: +972 2 651 85 93

Fax: +972 2 651 89 71

Email: rgugenh@minicom.co.il

Visit our Home Page!
<http://www.minicom.netmedia.co.il>

Circle 69 on Inquiry Card.

DON'T GET MAD!

GET YOUR MESSAGES!

TTI's New 4-PLAY
Voice Processing Card &
Voice Window Application Software
PEACE OF MIND FOR UNDER A THOUSAND DOLLARS

1-800-945-4884

MC/VISA/AMEX
Developers/OEM Packages Available
Specialist in International Sales and Support



Talking Technology, Inc. 1125 Atlantic Ave. Alameda, CA 94501 USA

Phone: 510 522-3800 Fax: 510 522-5556 Email: sales@tti.net Web: <http://www.tti.net>

Circle 68 on Inquiry Card.

Industrial Rackmount Computers



Low Profile 3.5" Rack chassis
PCI/ISA Backplane

- 19" Rackmount chassis (3-20 slots)
- All-in-one 80486 to PENTIUM CPU cards
- 3-20 slot ISA/PCI Backplanes
- 200-350W, 85-265 VAC Power Supplies, 48VDC, 24VDC, 12 VDC Version Available
- NEMA 4/12 Industrial Workstations
- Panel Display PCs



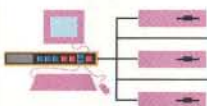
Western Region: 1-800-983-1177

Eastern Region: 1-800-886-2243

Circle 82 on Inquiry Card (RESELLERS: 83).

TAKE CONTROL of 2 to 64 SERVERS FROM ONE KEYBOARD, MONITOR AND MOUSE

- Any mix of PCs, Mac, and Sun



- Keyboard/mouse emulation
- AUTOSCAN
- Front panel & Hot key operation
- Remote access to 150'
- Desktop or rack mount
- Over 50,000 in operation

MasterConsole®
Rock solid, reliable control



CALL TODAY! 800-RCI-8090 X 71

DISTRIBUTORS LOCATED WORLDWIDE

RCI Europe (31)-10-458-6673
fax (31)-10-451-9610

RCI Taiwan (886) 2-218-1117
fax (886) 2-218-1221



Raritan Computer, Inc. 908.874.4072 fax 908.874.5274
10-1 Ilene Court, Belle Mead, NJ 08502 ■ sales@raritan.com ■ <http://www.raritan.com>

30 DAY MONEY-BACK GUARANTEE FULL 1-YEAR WARRANTY

Circle 70 on Inquiry Card
(RESELLERS: 71).

Industrial Strength PC Solutions



20 Slot Hot Swap Redundant PS

800-927-5464

408-452-9200 • 408-452-9210 FAX

In-House Design & Manufacturing



Call or Fax for Full Catalog
2032 Bering Dr. • San Jose, CA 95131

Rack Mount Products

- Rack mount Systems - 386 to Dual Pentiums
- Rack mount Chassis - Up to 20 Slots
- Custom Design & Modifications available
- Rack mount Monitor - Up to 20"
- Rack mount Cherry 101 Keyboard
- HDD / CD-ROM Enclosure - Hot Swappable
- NEMA 4/12 Workstation

Single Board Computers

- 386/486/Pentium - ISA / EIAS / VESA / PCI
- Passive Backplanes - from 3 slots to 20 slots
- Segmented Backplane Available

VISIT our World Wide Web

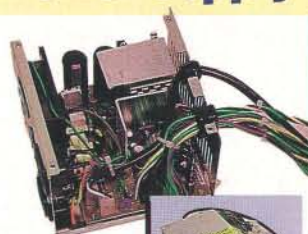
<http://www.appro.com>

E-Mail: appro@appro.com

Circle 79 on Inquiry Card (RESELLERS: 80).

Industrial PC Power Supply

- 85-265VAC, -48VDC, +24VDC, +12VDC input
- 70W-350W output
- 60KHz PWM control IC
- 0-55°C operating
- MTBF > 20 years



ICP ACQUIRE INC.

CALL: 1-888-618-6188

FAX: 415-428-1172



5.5"x5.9"x3.4"

Circle 86 on Inquiry Card (RESELLERS: 87).

All-in-one Flat-Panel Rack-Mount Systems

For Your PC-based Control Application

CERTIFIED
ISO
9001

\$1400

- TFT, EL or Mono flat-panel display
- 14-slot backplane
- 386/486/Pentium® with PCI Bus.
- 250 power supply
- Disk bay space: 5.25" x 1, 3.5" x 2

AXIOM
MEASUREMENT & CONTROL

Tel: 909-464-1881
Fax: 909-464-1882
E-mail: sales@axiomtek.com

Circle 84 on Inquiry Card (RESELLERS: 85).

PC-IN-A-BOX

Run DOS applications in ROM on portable systems. Complete with CPU, LCD, memory, peripherals, keypad, supply, support. \$299* up.

CPU CARDS

With Rom, Ram, Flash, Pcmcia

KS-7 All in one 486 SLC - \$299*
VGA, Ethernet, 4 Srl, 2 Par, Ide, Flop, Keybd, sound, 8M Ram/Flash.

KS-8 Portable Elan 386 - \$399*
5M mem, 3 Srl, 2 Par, CGA, batt. op.

KS-1 Low Cost Nec V40 - \$129*
3 Srl, 2 Par, 10 bit A/D, Modem.

*q 100, oem version see fine print for details

800-505-6749 • Fax 303-786-9983

KILA

Circle 75 on Inquiry Card.

Rackmount



- ENCLOSURES for 386, 486 & Pentium® Processors
- KEYBOARDS
- MONITORS
- DRIVE ENCLOSURES

PC Enclosures
from \$300

Monitor:
10" Super VGA
Color from \$650

Keyboards:
Drawer, Shelf &
Panel from \$85

- Excellent Air Flow & Cooling
- Accepts Most ISA, EISA, VESA, PCI Motherboards & Passive Backplanes
- Rack & Desk Models • Up to 20 Slots • Rugged, Modular Construction
- 200, 300 & 400 Watt Supplies, UL, CSA, TUV • Made in U.S.A.

Call or write
for descriptive
brochures, prices
or applications
assistance.

INTEGRAND
RESEARCH CORP.

8620 Roosevelt Ave. • Visalia, CA 93291

209/651-1203 FAX 209/651-1353

Web site <http://www.IntegrandResearch.com>

Email sales@IntegrandResearch.com

PC™ IBM • Pentium® is a
registered trademark of Intel
Corp. Drives and
computerboards not included.

Circle 74 on Inquiry Card.

RACKMASTER™

Fault Resilient System



RACKMASTER Systems, Inc.
"Total Rackmount Solutions"
2000-480-4384
612-894-4579 Fax
106-10 Lyndale Avenue South
Bloomington, MN 55420

Hot Swap 300W AC Power Supplies
-48V DC Power Supplies Optional
8, 14 Or 20 Expansion Slots
ISA/EISA/PCI Bus Architectures
VESA Form Factor Available
Slot Backplane Systems Available
• Card Cage Cooling Fans
Desktop, Tower Or Rackmount
• Exposed 5.25" Drive Bays
• Up To 4 Internal 3.5" Drive Bays
• Locking Door With Removable Filter
• Made In U.S.A.
• OEMs And VARs Welcome

Circle 88 on Inquiry Card.

Siliconrux

SRPC-210
19" Rackmount Case

386 to Pentium CPU Cards
ISA/ EISA/ VESA/ PCI

SR-420
Hot Swap Redundant PS
Avail. in 8/14 or 20 Slots

Computer Systems

- Completely Configured Systems
- Rackmount System Enclosures
- OEM/4/12 Industrial Workstations
- Monitors • Monitor Enclosures
- Keyboards • Keyboard Enclosures
- Single Board Computers
- 8 to 20 Slot Passive Backplanes

For more information
800-700-8560

<http://www.siliconrux.com>
E-mail: siliconrux@info.com
Tel. 408-720-1090 Fax 408-245-2570

Circle 81 on Inquiry Card.



FREE Instrumentation Software Demos

Software Showcase is a multimedia CD-ROM that gives you an interactive overview of the leading instrumentation software packages from National Instruments. Demonstration versions are included.

Software featured includes:

- LabVIEW graphical instrumentation software
- LabWindows/CVI visual development software
- ComponentWorks software for Visual Basic Measure software for Microsoft Excel
- VirtualBench turnkey virtual instruments

Software Showcase runs on Windows 3.1/95, Macintosh and Power Macintosh.

Call for a FREE Software Showcase

(800) 433-3488 Fax: (512) 794-8411 E-mail: Info@natinst.com

WWW: <http://www.natinst.com>
National Instruments

Circle 107 on Inquiry Card.

Custom Fast 20 SCSI Tools

SCSIVue™ Active Terminator

- Benefits:
- Improves SCSI Bus Performance
 - Less Errors; More Reliable Data Transfer
 - Diagnoses Problems • Analyzes Signal Quality

- Features:
- Active Regulation • Supports 68 Pin, 50 Pin
 - Status Indicators • Gold Contacts



Fast 20 & Ultra SCSI compatible



From: \$39

SCSIVue™ Gold Diagnostic Cables

- Benefits:
- No Loss Of Important Data
 - Faster Performance • Test Cable Integrity

- Features:
- Diagnostic Indicators • Large Ferrite Filters
 - Triple Shielding (Unique Cable Design)
 - Double Gold 20u" Plated Connectors
 - Extra Heavy 26 Gauge Wire, 50 & 68 Pin

Over 40 Cable Styles In Stock

SCSIVue™ Teflon Custom Internal Cables

- Benefits:
- Less Errors, Ultimate Performance
 - Silver Wire Improves Signal Quality

- Features:
- Perfect 90 Ohm Impedance Match
 - Triple Pronged Connector With Gold contacts

Custom Internal Cables in 1 DAY!



SCSI 2+3 COMPATIBLE

SCSIVue™ Active Digital Switch

- Benefits:
- Share SCSI Devices Between 2 Computers
 - Attach up to 14 Devices to 1 Computer

- Features:
- 2-1 Active Digital Switch/Repeater
 - Regenerates SCSI Signal for Long Runs

Granite D+G+T+A+L
<http://www.scsipro.com>

The SCSI Solution Company

3101 Whipple Rd. • Union City, Ca. 94587 • Ph: 510-471-6442 • Fax 510-471-6267

Circle 89 on Inquiry Card (RESELLERS: 90).

Worlds Smallest with Power Supply Inside Win 95 Plug n' Play

Portable Multi I/O Drives

Parallel SCSI PCMCIA 1 Gig \$499

Up to 4 Gigs

JAZ in 40% the size

JAZ

Fits in suit coat pocket.

• 1 Gig JAZ

• 640MB Optical

4x to 8x multi I/O CD-ROM/CDR

2.6 to 4.6 Gigs multi I/O Optical

4-16 Gigs DAT multi I/O

Internal Power Supply

SCSI Connection or \$100 PC Card (PCMCIA)

To Computer Parallel Port Now 30% Faster

To Printer

JAZ w/ Battery Optical w/ Battery 4 Gigs w/ Battery

9 Gigs Hard Drive

Internal UPS Battery Option! with All drives up to 4 Gigs

ph: (408) 983-1127

<http://www.libertyinc.com>

FAX (408) 243-2885 Leave Email address

Circle 91 on Inquiry Card.

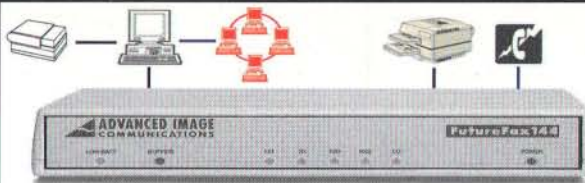
SMART FAX MODEM?

Yes, a fax modem that works with your PC off!!

Introducing The Fax Modem That Stands Alone...

The FutureFax 144

ADVANCED MULTI-FUNCTION FAX SYSTEM
FOR DOS, WINDOWS & NETWORKS



- ✓ Send/Receive Faxes With Your PC Turned Off!
- ✓ Print Plain Paper Faxes Directly To Your Printer and save hundreds of \$ on thermal paper.

- ✓ STORES FAXES IN MEMORY
- ✓ VIEW FAXES BEFORE PRINTING
- ✓ FORWARD TO REMOTE LOCATION
- ✓ COMES WITH FREE SOFTWARE
- ✓ SUPPORTS CAS APPLICATIONS
- ✓ SEND FAXES WITH ANY SCANNER
- ✓ V.42, MNP DATA MODEM
- ✓ UP TO 32MB OF MEMORY
- ✓ AC OR BATTERY OPERATION
- ✓ AND MUCH, MUCH MORE!!

Call our 24 Hour
Fax-On-Demand System
for FREE Information.

1-888-GET-FAX4



ADVANCED IMAGE COMMUNICATIONS
3343 VINCENT RD. #D PLEASANT HILL, CA 94523 FAX 1-510-947-1900

Circle 92 on Inquiry Card.

Let your "true colors shine through"
when you advertise your
computer products in the

BYTE

HARDWARE/SOFTWARE SHOWCASE

our popular, affordable,
4-color advertising section!

For more information call your BYTE sales
representative (see listing,
page 201) or fax 603-924-2683

Laptops & Notebooks • Memory/Chips/Upgrades • Misc. H/W

Misc. H/W • Multimedia • Programmable H/W

166Mhz PENTIUM processor POWER

BYTE MAGAZINE RECOMMENDED!**BYTE****BEST****LOW COST**

- 11.3" 800x600 Dual-scan Color screen, 2MB DRAM. Optional 12.1" or 10.4" TFT Active Matrix.

- Built-in 6x CD-ROM drive, 16-bit stereo sound, 2 speakers, & mic.

- Two type II PCMCIA slots, serial, parallel, MIDI, PS/2, & infrared ports.

- Windows 95 or DOS / Windows.

- 1GB removable PCI EIDE HD (up to 2.1GB available).

- 16mb RAM (maximum 32mb) and 256K level 2 cache.

- 1 year parts and labor warranty. Extended warranties available.

- PS/2 Glide Point & Joystick.

- 3.5" removable floppy drive.



- Please visit our web page for the latest specs and prices!

Micro International, Inc. 10850 Seaboard Loop, Houston, Texas 77099. Top quality merchandise with excellent service and support since 1984! Houston: (713) 495-9096. Fax (713) 495-7791. Hours: 8-6 Monday-Friday.

*Pentium is a registered trademark of Intel Corporation.

1-800-967-5667
Internet: <http://www.pcmint.com>

American Made Chassis



- Complete line of models & sizes in stock
- Computer Chassis
- CD-ROM Enclosures
- RAID Enclosures
- 19" Rack Cabinets
- Hot Swapable Power Supplies
- Removable Disk Drive Modules
- NEW! ATX-style chassis
- Designed for FCC certification
- Competitive prices
- Custom colors & designs available

Call NOW for information and catalog

CALIFORNIA
PC PRODUCTS

1-800-394-4122

VISA & MasterCard accepted - Same day shipment!
408-638-9460 - 205 Apollo Way - Hollister, CA 95023

Circle 95 on Inquiry Card (RESELLERS: 96).

HeatSentry™

The only way to make sure your super-powered PC is properly cooled!

- Make sure your system and CPU are operating at proper temperature.
- Know the exact temperature of your system and CPU at all times.
- Prevent heat-related system crashes.
- Protect your data.
- Prolong your PC's life.
- Be notified automatically of overheating conditions.
- Windows 3.1/95/NT, Novell versions available.

1-888-848-4321
<http://www.camusa.com>

CAMELEON TECHNOLOGY, INC.
816 Chancery Ave., San Jose, CA 95131 Tel: 1-408-321-9880 Fax: 1-408-321-9885

Circle 93 on Inquiry Card (RESELLERS: 94).

Design, Print and Apply CD Labels for \$79⁹⁵

That's NEATO!

NEATO™ CD LABELER KIT™

- 1 Create your own artwork On Your Computer with easy-to-use NEATO Templates.
- 2 Print on Any Laser Printer using NEATO pressure sensitive die-cut labels.
- 3 Using the NEATO Label Device, apply labels... PERFECTLY EVERY TIME!

ORDER NOW! FREE 100 LABELS

KIT INCLUDES:

- Label Design Templates (PC & Mac)
- The Amazing Neato Labeler
- Complete Instruction Guide

800-984-9800
MicroPatent™ 250 Dodge Ave. • East Haven, CT 06512
203-466-5170 • Fax 203-466-5178
In Europe: +44 (0)990 561571 • Fax +44 (0)181 932 0480
See us at: <http://www.neato.com>

Circle 99 on Inquiry Card.

Sliger

is a vertically integrated design and manufacturing company specializing in computer enclosures, disk subsystem enclosures and fully integrated systems.

Engineering • Design • Fabrication

Now Supporting **ATX**

Industrial PC Enclosures
Tower PC Enclosures
Tower Drive Enclosures
Rack Systems
Rackmount Accessories
CPU Cards and Backplanes
Rackmount Drive and PC Enclosures
Industrial PS2 Power Supplies
Redundant N+1 Load Sharing Power Supplies

Phone: 1-702-356-5595 **Fax:** 1-702-356-6361 **Email:** info@sliger.com
Internet: <http://www.sliger.com> **Postal:** 1385 Greg St. Suite 101 Sparks, NV 89431

Circle 97 on Inquiry Card (RESELLERS: 98).

Flashlite™

- 8 Mhz V-25 + Processor
- 512 KB RAM
- 256 KB Flash
- 2 Serial Ports

EDN 100 Hot New Products of 1995

Single Board Computer with DOS and Utilities \$195

Embedded controller applications: Simple software development:

- 2 fast DMA channels
- 8 analog inputs with programmable comparator levels
- priority interrupt controller with vector or register bank switching.

- Create on a PC compatible computer.
- Download in .EXE or .COM format to flash disk.
- Test and debug through the console serial port.
- Modify the startup batch file to load and execute the application on reset or powerup.

JK microsystems 510 236-1151 fax 510 236-2999
1275 Yuba Ave., San Pablo, CA 94806 <http://www.dsp.com/jkmicro>

Circle 103 on Inquiry Card.

Low Cost 16-bit Controllers

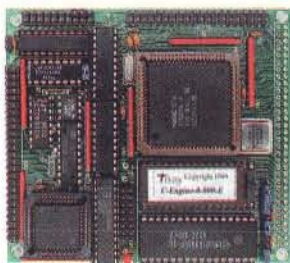
Easy to program in Borland/Microsoft C/C++.

V104™ Prices start at \$149 Qty 1, \$59 OEM

- 4.0x3.5", 32+24 I/O, LCD, PC/104 interface
- 3 UARTs, 3 timers/counters, RTC, watchdog
- 11 12-bit ADC, 4 12-bit DAC, Networking
- C library, Development kits



216 F St. #104, Davis CA 95616 USA
Tel: 916-758-0180 Fax: 916-758-0181
Internet Email: tern@netcom.com
ftp://ftp.netcom.com/pub/tern



Circle 102 on Inquiry Card.

Embedded Controller Kit A Complete Software and Hardware Solution

Z-World's EasyStart Kit™ provides everything you need to begin embedded systems development. The kit contains our Micro-G controller (smaller than a credit card with 14 I/O lines, RS232, 128K flash EPROM, 32K RAM and ADC), Dynamic C™ EasyStart (a simplified C development system), sample circuit/prototyping board, power supply, documentation and all the cables necessary to start development immediately.

Only \$279!



1724 Picasso Ave.
Davis, CA 95616
916.757.3737
916.753.5141 FAX

For quick info, call our AutoFAX
916.753.0618 from your FAX. Request
data sheet #35. Or visit our web site at
<http://www.zworld.com>.

Circle 100 on Inquiry Card.

C-Programmable Controllers

The Miniature Controller Specialist since 1983

Z-World provides a complete software and hardware solution for embedded systems and control applications. Our low cost miniature controllers provide a variety of digital I/O, ADC, DAC, and RS232/RS485 communications. For only \$195, our Dynamic C™ integrated C development system allows you to create real-time multi-tasking programs up to 512K (approx. 20,000 lines of C code).

Controller pricing from \$79. Quantity discounts start at 5 units.

1724 Picasso Ave. For quick info, call our AutoFAX
Davis, CA 95616 916.753.0618 from your FAX. Ask
916.757.3737 for catalog #18. Or visit our
916.753.5141 FAX web site at <http://www.zworld.com>.



Circle 101 on Inquiry Card.

Tape Solutions

...The Tape Experts



- 9 TRACK
- 3480 • 3490 • 3490E
- LIBRARIES

Qualstar Corporation
6709 Independence Avenue
Canoga Park, CA 91303

FAX (818) 592-0116 TEL (818) 592-0061
(800) 468-0680

Circle 104 on Inquiry Card.

All steel construction Server & RAID chassis

- Front access with 14 "5 1/4" exposed drive bays
- Lockable front and both side doors
- 6 ball bearing cooling fans pre-installed
- 4 lockable casters pre-installed
- Redundant & heavy duty power supply options

Also available other server & RAID chassis

ATX!



Non-Stop Server Chassis

- Front access 10 "5 1/4" exposed drive bays
- Lockable front door, open able side doors
- w/300W AT UL P/S.....\$178
- w/2x300W R.P.M.....\$399



Slide-in M/B Drawer

- M/B: ATX, Baby AT, Full Size AT
- Drive Bays: 5.25"x3, 3.25"x2, 3.25"x2 (Internal)
- FCC class B, CE

Removable Hard Drive Modules

- Wide SCSI, SCSI or IDE
- Available, Patent protected
- Perfect for RAID & removable storage application



ATX! Senstron

Heavy Duty Power Supply

ETA-4600	600 watt AT	\$221
ETA-4500	500 watt AT	\$165
ETA-4000	400 watt AT	\$146
APA-5400F-RV	400 watt AT ATX	\$195
SP2-4400	400 watt P/S2	\$121
SP2-4300	300 watt P/S2	\$ 61
AP2-5400F-RV	400 watt P/S2 ATX	\$155

Also available other power supply, 5.4V output optional.

Non-Stop Redundant Power Supply

- Balance Load-Sharing Design
- Power Fault Alarm/LED/Signal

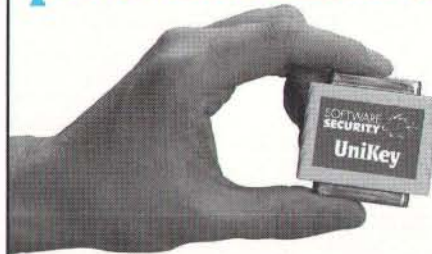


AEH CORP.

254 S. 5th Ave., La Puente, CA 91746
Tel: (818) 369-2608 • Fax: (818) 961-0468
Central, TX, 800-454-9999 • M.T.C., NY, 800-366-4860

Circle 109 on Inquiry Card (RESELLERS: 110).

We make software protection easier to handle.



Software Security's new UniKey® technology could change the way you think about software protection forever.

Even though our new hardware keys are small, they still offer the most powerful and reliable barrier against software piracy ever developed.

And with competitive pricing, they won't squeeze your margins either.

- Secure protection for multiple applications/versions

- The industry's only patented protection technology

- Protects applications quickly, without programming

- Remote update capabilities

- DOS/Windows/95/NT/Unix/NetWare support

- Time/date-based execution control
- Made in U.S.A.

UniKey makes software protection easier on your customers, your developers, and your budget... but harder than ever on pirates.

Call **1-800-841-1316** for more information, or to order our Developer's Kit, with everything you need to try UniKey protection on your application.

SOFTWARE SECURITY



A new slant on software protection

6 Thorndal Circle, Darien, CT 06820-5421
(203) 656-3000 • Fax: (203) 656-3932
<http://www.softsec.com>



Circle 108 on Inquiry Card.

NTMail™ NTList™ NTDomain™

*the backbone
mail system
for Windows NT™ &
Windows95™*

- ♦ full featured SMTP, POP and FINGER server
- ♦ highly configurable, secure list server
- ♦ multiple independent mail domains on a single machine
- ♦ graphical installation and configuration

FROM ONLY \$49

A **FREE** FULLY FUNCTIONAL
TIME LIMITED EVALUATION COPY
IS AVAILABLE ON OUR WEB SITE

Est Cancel Help

all trademarks are acknowledged and are the property of their respective owners

Internet Shopper Limited - PO Box 6084 - London - SW12 9XG - ENGLAND
<http://www.net-shopper.co.uk> ☎ 011 44 181 673 7422

Circle 111 on Inquiry Card (RESELLERS: 112).

Put Your Company on the World Wide Web!

INTERNET

**VIRTUAL
WEB
HOSTING**

\$24.95
per month*

Place your order directly
into our automated
online system at:
<http://www.hway.net/home.html>

* minimum contract and 48 hr set-up fee required
FSD charge billed separately by InterNIC

- Domain name registration provided (http://your_name)
- Unlimited updates via your own FTP account
- Complete domain mail processing (Multiple POP3, forwarding, autoresponders)
- 500 MB of data transfer per month (10.12 per MB over 500 MB)
- 20 MB of disk space for your html documents & graphics (11 per MB over 20 MB)
- T3 Connectivity to the Internet
- Unlimited e-mail address forwarding
- Microsoft Front Page® support
- CGI Scripting (Now includes shopping cart!)
- Cybercash support
- Detailed web usage statistics & access to raw log files
- Controlled anonymous FTP
- TrueSpeech® server support included (real-time audio)

Also Available:
Real Audio™ 2.0
SSL Secure Processing
MySQL Database Tools

Hiway Technologies
THE WORLDWIDE LEADER IN WEB HOSTING

<http://www.hway.net> 1 800 339-HW/AV sales@hway.net (407) 989-8574

Circle 114 on Inquiry Card
(RESELLERS: 115).

FREE ENGINEERING SOFTWARE CATALOG



Engineering Software Direct is your #1 source for engineering software! The more than 1,000 products listed in this catalog were developed by companies and practicing engineers and represent a vast resource of tools that can help you get your job done better, more accurately, and more quickly.

1-800-898-9044

SciTech

SciTech International 2525 N. Elston Ave., Chicago, IL 60647 • Tel 773.486.9191
Fax 773.486.9234 • e-mail info@scitechint.com • URL <http://www.scitechint.com>

Circle 113 on Inquiry Card.

Lahey

Computer Systems, Inc.

Fortran is our forte

Specializing in Fortran
Language Systems Since 1967

The Lahey Advantage

FREE, unlimited,
expert technical support.

Guaranteed bug fixes or
workarounds within
60 days.

30-day
money-back
guarantee.

FREE
product patches
on the Web at
<http://www.lahey.com>.

800-548-4778
or
702-831-2500

Fax: 702-831-8123
sales@lahey.com
<http://www.lahey.com>

LF90 Delivers!

*Speed. Dependability.
Great Tech Support.*

Create Fortran programs or port
legacy code to the PC with the
most-productive, best-supported
Fortran 90 language system.

Lahey Fortran 90

■ Fortran-smart Windows
Development Environment.

■ DOS, Windows 3.1x,
Windows 95 and
NT Support.

■ DLL interfaces to VB,
VC++, and Borland C++.

■ State-of-the-Art Intel
Pentium and Pentium Pro Optimizations.

US\$895
Educational, multiple-copy, and
site-license pricing available.

Lahey Computer Systems, Inc.

865 Tahoe Blvd., P.O. Box 6091
Incline Village, NV 89450 U.S.A.

Circle 116 on Inquiry Card (RESELLERS: 117).



Word Processor Drawing Editor Widget Set
Application Builder Scripting Language Coding Tool
Mail Reader, Writer, Manager
Compound Document Architecture
Objected-Oriented, C++, UNIX, X11

The Andrew User Interface System has been a part of
the campus computing environment of Carnegie Mellon
University since 1986 and has continuously evolved to remain
at the forefront of multimedia information technology.

Just Released! Andrew 7.4 Binaries in C++

Andrew Consortium, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213

Web: <http://www.cs.cmu.edu/~AUIS> Tel: (412) 268-6710

Circle 119 on Inquiry Card (RESELLERS: 120).

"Run Client/Server Applications Securely over the Internet"



- Use the Internet as a secure virtual Wide Area Network
- Develop powerful Internet applications using 4GL tools
- Use SQLWindows, Visual Basic, Powerbuilder, Delphi, C++...
- Provides automatic data-stream encryption for all SQL data
- Uses RSA security and Netscape's secure socket references
- Includes a complete enhanced version of SQLBase v6.1
- Transparent to users, developers and administrators

Use the Internet to securely access your client/server applications

Use Client/Server tools for remote access solutions!

Pricing starts at \$1,595 for a 5-user version

Call 1-800-486-DUNN ext. 405

<http://www.dunnsys.com>



DUNN
systems, inc.

Circle 118 on Inquiry Card.

VIRTUAL REALITY

FIVE GREAT PUBLICATIONS!
ONE LOW PRICE!

Virtual Reality an Exploding Technology is an exclusive report on the explosion of VR in medical, amusement, consumer and other arenas. Plus news blurbs on market entry by heavyweights & Fortune 500's.

VR Resource Directory is your guide to hundreds of companies involved in VR products, books, software, professional trade organizations, clubs, more!

VRML Primer explains VRML, building virtual worlds on the internet, great VR worlds to visit on the internet, ABCs of setting up your own internet home page, more!

Desktop VR contains a complete primer on using VR on your PC, plus, where to get low cost HMDs (head mounted displays) & other equipment, the famous Mattel Powerglove hack (converting a \$69 Powerglove for use with VR), Powerglove sources, listing of virtual world building software, comprehensive listing of HMD compatibility with popular games & software, more!

VR InfoMania contains great listings of internet websites devoted to VR, VR books, VR magazine articles & research papers, internet FTP download sites & VR-related newsgroups, article listings from back issues of VR magazines, where to go to experience real VR, reviews of popular VR books, glossary of VR terms, great VR applications, the future of virtual sex, more!

FREE BONUS!

The first 1,000 orders will receive the publication **VR Cartoons** featuring dozens of funny cartoons about VR! Yours absolutely FREE! This is a limited printing, so don't miss out! Order today!



24 HOUR
TOLL FREE
ORDER LINE

1-800-951-7100
FAX ORDERS 619-485-8968

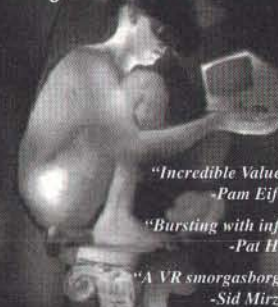


Send Check or Money Order to: Virtual Reality Publishing
16486 Bernardo Center Drive, Suite 378, San Diego CA 92128

*Same day shipping on FedEx orders received before 4 pm EST. Personal check orders held 2 weeks for check to clear. No COD orders. International orders must be paid in US funds. Call for International S&H charges. We participate in the BBB Care Program through the Better Business Bureau of San Diego.

ORDER TODAY... HAVE IT TOMORROW!*
Circle 61 on Inquiry Card (RESELLERS: 62).

VR
InfoSource



"Incredible Value!"

-Pam Eifert

"Bursting with info"

-Pat Holt

"A VR smorgasborg!"

-Sid Mirzad

FIVE PUBLICATION SET!
Plus FREE BONUS "VR Cartoons!"

Five Great Publications!
One Low Price!

ONLY \$49.95

Special introductory price!
ONLY \$39.95
Limited Time!

Plus \$3⁹⁵ S&H
Calif. residents
add sales tax

2-3 Day Delivery*
Fedex Overnight Air* 1-4pm

Order Today... Have it Tomorrow!

Same Day Shipping on Air Orders Received Before 4 pm EST

30-Day
100% Satisfaction
Money-Back
Guarantee!

SOFTWARE PIRATES:
(AND YOU KNOW WHO YOU ARE)
**WE'RE PUBLISHING THIS
NUMBER SO THAT YOU
WILL BE TURNED IN.**
1-800-388-7478

DON'T
COPY
THAT
FLOPPY.™

**SOFTWARE
PUBLISHERS
ASSOCIATION**

©1994 Software Publishers Association

THE BUYER'S MART

THE BUYER'S MART is a unique classified section organized by product category to help readers locate suppliers. Each ad has Inquiry numbers to aid readers requesting information from advertisers.

AD FORMAT: Each ad will be designed and typeset by BYTE. Do NOT send logos or camera-ready artwork. Advertisers should furnish

typewritten copy. 2"x1 1/16" ad can include headline (23 characters maximum), descriptive text (300 characters is the maximum recommended) plus company name, address, telephone and fax number. 2"x2 5/8" ad has more space for descriptive text (850 characters is the maximum recommended). **DEADLINE:** Ad copy is due

approximately 2 months prior to issue date. For example: November issue closes on September 8. Send your copy and payment to:
THE BUYER'S MART, BYTE Magazine, 1 Phoenix Mill Lane, Peterborough, NH 03458. For more information please call Vivian Bernier in BYTE sales at 603-924-2521 or FAX: 603-924-2683.

RATES (Jan. 1996)

	3-5 issues	6-11 issues	12 issues
1 ad	\$790	\$760	\$665
2 ads/issue	-	-	635
3 ads/issue	-	-	600
1 ad	\$1,580	\$1,515	\$1,330
2 ads/issue	-	-	1,265
3 ads/issue	-	-	1,200

*****COLOR - Add \$100*****

ACCESSORIES

SVGA Splitters

Monitor, Keyboard and Mouse splitters, multiplexers and high quality cables to 250 feet.

- > Connect 2 or more monitors to your PC
- > Support to 1600x1200 - **MADE IN USA**
- > Access 1 PC from several keyboards or vice versa
- > SVGA <> TV Converters

HALL RESEARCH <http://www.hallresearch.com>

Santa Ana, CA (714) 641-6607

800-959-6439

BAR CODE

Labeling Software

For DOS and Windows with dot-matrix, LaserJet or DeskJet. Easy WYSIWYG design. Any format/size. Mix big text, bar codes, and PCX graphics. Formats for AIAG, KMart, Sears, MIL-STD, Penneys, WalMart. File Input. LabelRIGHT for DOS-\$279. LabelRIGHT for Windows-\$295.

30 Day Money Back Guarantee

Worthington Data Solutions
(408) 458-9938 **800-345-4220**

BAR CODE

BAR CODE READERS

For PC, XT, AT, PS/2, & Serial Terminals

- > Emulates Keyboard: Works With Any Software
- > Data Appears as Keyboard Input
- > Uses Enhanced Decoding Algorithms
- > Accepts Wand, Slot/Badge, CCD, Laser, Magnetic Stripe Reader, & RS232 Serial Input
- > Reads All Popular Bar Codes (16 types)
- > Reads HIGH, MEDIUM, & LOW density codes
- > Auto-Discriminates Between Bar Code Types
- > Easily Programmed with a Bar Code Menu
- > Over 140 User Configurable Options
- > Daisy Chain Up to 96 Readers
- > Supports NOVELL Networks
- > Supports US & INTERNATIONAL Keyboards
- > Direct From Manufacturer
- > 30-day \$\$ Back Guarantee, 1 Year Warranty
- > Complete Unit with LASER Scanner - \$645
- > Complete Unit with CCD Scanner - \$299
- > Complete Unit with WAND Scanner - \$299

AMERICAN MICROSYSTEMS

2190 Regal Parkway, Euless, TX 76040

(800) 648-4452 (817) 571-9015 FAX (817) 685-6232

www.amitd.com

BAR CODE

Portable Reader

- * AA Battery Operated, 64K or 256K
- * Display messages and optional voice messages tell operator what to do. Messages are easily recorded (like answering machine) in any language. This unit is EASY!
- * Double duty as Non-portable Reader
- * 4x20 Supertwist LCD Display, 35 Rubber Keys
- * 2 Built-In Inventory Programs or create custom
- * Download tables and Pick Lists
- * Wand, CCD, or Laser Scanner Input
- * Reads 2of5, UPC/EAN, 128, Code 39, etc.
- * 2 year Warranty on Reader & Wand
- * 30 Day Money Back Guarantee
- * 64K Complete with Integrated Laser - \$1299
- * 64K Complete with Steel Wand - \$799
- * Small Size and very long battery life

<http://www.cruzio.com/~wds>

Worthington Data Solutions

3004 Mission Street • Santa Cruz, CA 95060

408-458-9938 • FAX 408-458-9964 **800-345-4220**

RF Terminal

Communicates 2 way to Serial Base Station from 400-1000 ft. Easily covers 1,000,000 square feet. 1-16 terminals per base station. Keyboard, wand, CCD or laser scanner input. 16 Selectable frequencies. Small size and low weight - 14 oz. with batteries. Base Station - \$845 Terminal - \$1095.

<http://www.cruzio.com/~wds>

Worthington Data Solutions

3004 Mission Street • Santa Cruz, CA 95060

408-458-9938 • FAX 408-458-9964 **800-345-4220**

Windows Bar Code Fonts

Add bar codes to any font based Windows program. Fonts designed for dot matrix, DeskJet and LaserJet. Print Codabar, 2 of 5, Code 128, UPC/EAN and Code 39 inside your Windows program. TrueType fonts, bitmaps and metafile support included. Only \$199.

Worthington Data Solutions

(408) 458-9938

(800) 345-4220

Bar Code Readers

for PC, XT, AT, PS/2, Macintosh and Serial Terminals

- * Attaches as 2nd Keyboard, no software changes
- * Reads 2of5, 128, UPC/EAN, Code 39, etc.
- * External or Internal attachment on PC
- * Wand, CCD, Slot Badge, Magstripe or Laser
- * Supports DOS, Novell, UNIX, Mac OS, etc.
- * 100+ Configurable Options
- * Supports USA and International Keyboards
- * 2 Year Warranty, 30 Day \$ Back Guarantee
- * Direct From Manufacturer
- * Top Rated by Independent Review
- * Complete with CCD Scanner - \$399
- * Complete with Laser Scanner - \$655
- * Complete Wand only Reader - \$299

<http://www.cruzio.com/~wds>

Worthington Data Solutions

3004 Mission Street • Santa Cruz, CA 95060

408-458-9938 • FAX 408-458-9964 **800-345-4220**

Portable Bar Code Reader

- > Use as a PORTABLE, WEDGE, or SERIAL
- > 9V Battery Operation with Lithium Backup
- > 2x16 Supertwist LCD Display
- > 54 Key Keyboard with Separate Numeric Keys
- > Real-time Clock Supports Date & Time Stamps
- > Reads all Popular Bar Codes (16 types)
- > Wand, CCD, Laser, or Serial Input Devices
- > Built-In Program Generator
- > Create Your Own Custom Programs
- > 6 Built-In Inventory Programs
- > Up to 250 Programs Can Reside in Memory
- > Create up to 250 Data Files per Program
- > Up to 250 Look-Up Files in Memory
- > Built-In Calculator
- > Supports Hayes Compatible Modems
- > 64K Memory with Data Compression
- > 30-day \$\$ Back Guarantee - 1 Year Warranty
- > Complete Unit with WAND Scanner - \$795

AMERICAN MICROSYSTEMS

2190 Regal Parkway, Euless, TX 76040

(800) 648-4452 (817) 571-9015 FAX (817) 685-6232

www.amitd.com

Bar Code Printing Software

LabelWorks for Windows

- > Prints all Popular Bar Code Types (19 Types)
- > Desktop Publishing Features: WYSIWYG, Scalable Fonts, Rulers, Guides, Lines, Shapes, Page Zooms (25%-400%), Templates
- > Rotates Text, Bar Codes, and Graphics
- > Supports Windows Compatible Fonts
- > Choose From Over One Hundred Popular Label Formats or Design Your Own
- > Rich Text Support: Mix Styles, Types, & Sizes
- > Automatically Prints Serial Numbers
- > Imports & Exports Graphic Files: TIFF, GIF, BMP, PCX, WPG, WMF, TARGA
- > Supports Virtually all Windows Compatible Printers (PostScript, Laser, & Dot Matrix)
- > 30-day Money-Back Guarantee, \$295

CALL FOR FREE DEMO SOFTWARE

AMERICAN MICROSYSTEMS

2190 Regal Parkway, Euless, TX 76040

(800) 648-4452 (817) 571-9015 FAX (817) 685-6232

www.amitd.com

Bar Code Library DLL

Bar Code Library sends bar codes to the display, Windows clipboard, bitmap file, or printer. Bar Code Library supports most applications with a built-in programming language that can call a DLL. \$329. 32 Bit version \$649.

StrandWare, Inc.

715-833-2331 Fax: 715-833-1995

800-552-2331 (in US)

Inquiry 451.

BAR CODE

WINDOWS™ LABEL PRINTER

GEMINI is the ADC industry's first Windows-only label printer. Impeccable print quality, rugged all-metal construction, many bonus features standard; allows you to print labels and bar codes from the Windows applications you already use, without special labeling software or programming. Reseller inquiries welcome.

THARO SYSTEMS, INC.

P.O. Box 798, Brunswick, OH 44212-0798
http://www.tharo.com/tharo/ Internet E-mail: tharo@tharo.com
330-273-4408 Fax: 330-225-0099

Inquiry 452.

BOOKS

12,000 COMPUTER TITLES

Easy browsing & ordering in our online stores. Computer books from 450 publishers. Web URL <http://www.compbooks.com>. Excellent customer service & technical assistance. Worldwide FedEx & US Mail shipping. MC/Visa/AmEx/Novus/JCB cards.

CompuBooks® Online Bookstores

512-321-9652 Fax 512-321-4525 800-880-6818

BUSINESS SOFTWARE

Accounting Software

<http://www.capitalsoft.fi>

□ 100% C++/MFC □ Source Available □

Oy Capital Soft Ltd

Tekniikantie 12, FIN-02150 Espoo, Finland
Phone: +358-9-4354 2450 Fax: +358-9-455 8508

Inquiry 453.

CAD

Circuit Design Software for Windows
Easy-to-use schematic entry, PCB design, and simulation software, starting at \$149 each. Complete PCB package with schematics, autorouter, and layout for 2-layer circuit boards, \$399. Enhanced version with autoplacement, more symbol libraries, and up to 16 layers, \$649. CAM file outputs.

Mental Automation, Inc.

5415 136th Place, SE-Bellevue WA 98006
(206) 641-2141 FAX (206) 649-0767 BBS (206) 641-2846
<http://www.mentala.com/>

Inquiry 454.

CAD/CAM

CONTOURING MOTION CONTROL

FROM A PRINTER PORT!

Indexer LPT™ software

VERSION 3

\$249

VISA/MC

- Controls up to six step motors simultaneously.
- Linear and Circular Interpolation.
- New features to accommodate machine control.
- Easy-to-use device driver. Super Manual.
- CAD-CAM interface available.

Ability Systems

<http://www.abilitysystems.com>

Corporation, 1422 Arnold Ave.
Roslyn, PA 19001 (215) 657-4338
FAX: (215) 657-7815

Inquiry 455.

CAD Solutions Software

TG-CAD Professional v.6.0

A 16 & 32 bit C/C++ Windows 95, Win NT & Win 3.1 CAD Developers Kit. The best in CAD/CAM software kits. Free Demo and Technical Paper.

1-800-635-7760

Fax: 214-423-7288 BBS: 214-881-9322

Disk Software, Inc. P.O. Box 941152, Plano, TX USA 75094

E-Mail: disksoft@ix.netcom.com

Inquiry 456.

CD-ROM

Consolidated CDROM, Inc

Worldwide suppliers of CD-ROM software. We do import, export, publishing & distribution. We also buy & sell all types of memory chips. Dealers Wanted!

102 Greenwood Ave Wyncote PA 19095 USA
800-8CD-ROMS 215-572-9831/215-572-9832 fax
Email: cdrom@consldcdrom.com / www.consldcdrom.com

Inquiry 457.

CD-ROMS

JAVA - Dev Kit, ...	\$25.00
HotJAVA browser, demo applets, on-line docs	
WINDOWS 95.COM...32-bit Shareware Collection	\$30.00
WINSITE	\$35.00
Utilities for Windows 3.1, NT, Windows 95, more!	
HOBBES OS/2	\$35.00
Software, games, utilities, fixes, updates	
BSDISC - NetBSD, FreeBSD, XFree86 & X11R6	\$35.00
INTERNET TOOLS	\$30.00
Networking tools & utilities SLIP & PPP	
LINUX Developer's Resource	\$25.00
Slackware, Red Hat!, more!	
LINUX Installation & Getting Started Guide	\$7.50
245 pg manual	
LINUX TOOLBOX -	\$45.00
CD Set & Install Guide. For beginners!	
MOO-TIFF for LINUX - 100% Motif compatible GUI	\$99.00
MOO-TIFF for FreeBSD - 100% Motif compatible GUI	\$99.00
MOTHER OF PERL	\$35.00
Source & binaries for UNIX, DOS, NT, MAC	
RUNNING LINUX	\$19.95
576 pg manual for everything about Linux	
SOURCE CODE - 4.4 BSD-Lite2, GNU, InterViews, more	\$30.00
STANDARDS - RFCs, IENs, ITU/CCITT BlueBook	\$30.00
TCLTK - software to develop X-Windows apps	\$35.00
TeX - typesetting tools for mathematical & scientific docs	\$35.00
WORLD WIDE Catalog	\$30.00
See the WWW without being on-line!	
X-FILES - Complete sources for X11R6 & XFree86	\$35.00
Phone Orders: 1-800-800-6613	
Fax Orders: +1-520-526-9573	
Int'l Phone: +1-520-526-9565	
Web Orders: www.informagic.com	
E-mail: orders@informagic.com	
InfoMagic 11950 N. Hwy 89, Flagstaff, AZ 86004	

Inquiry 458.

CD ROM TOWERS & JUKEBOX SERVERS FOR ALL OPERATING SYSTEMS! RAID NOW AVAILABLE

No Device Drivers/ MSCDEX needed, Complete Kit. Networks CD Roms, unlimited user license, DISCPORT.

"YES, NONE BETTER AT ANY PRICE"

Call NOW: 1 (800) 482-1866 305-597-3980

<http://www.jescdrom.com>

Inquiry 459.

WALNUT CREEK CDROM

FreeBSD. 2.1 Rock solid Berkeley Unix for PC w/src.	
2 disc set, easy install, 6 mo updates	\$39.95
Slackware Linux. 2 disc *OFFICIAL* Slackware 3.0.	
Internet's favorite. Quarterly updates	\$39.95
Cica MS Windows. 4000+ Windows programs, games, drivers, fonts, shells, src. Indexes in German/Spanish/Italian/French/English/Japanese. Quar. updates	\$29.95
Hobbes OS/2. 1000 MB Free/Shareware drivers, app's, etc. OS/2 Mag's product of the year! 6 mo updates	\$29.95
Simtel MSDOS. 2 discs, premier Internet technical, programming Free/Shareware	\$29.95
Black Hawk. - New Win. 95 shareware collection	\$29.95
Internet Info. 17,000 doc's. FAQs, FRCs, & IENs	\$39.95
Music Workshop. 2 Music prog., midi, demos, etc	\$39.95
Project Gutenberg. 350+ Copyright free books	\$39.95
Scientific Library. Technical shareware. DOS/Win	\$39.95
POV-Ray. Ray-tracing images, src, documentation	\$39.95
60+ titles about Windows 95 & NT, games, Tel, perl, QRZ! Ham Radio, Music, Fonts, Royalty-free images	
Call for your FREE catalog today!	
All our products are unconditionally guaranteed!	
1-800-786-9907	
4041 Pike Lane, Ste D-214, Concord, CA 94520	
+1-510-674-0783 Visa/MC/AMEx, Fax: +1-510-674-0821	
orders@cdrom.com http://www.cdrom.com/	

Inquiry 460.

DATA ENTRY SOFTWARE

DATA ENTRY SOFTWARE

Full featured, heads-down data entry with two-pass verification, edit language, output record reformat, operator statistics, key from images (NEW!), free tech support. For PC, PC LAN, S/36, AS/400.

FREE 30 day trial.

Computer Keyes Tel: 206-776-6443
21929 Makah Rd., Fax: 206-776-7210
Woodway, WA 98020 USA: 800-356-0203

DATA RECOVERY

We Can Save It!

All Platforms - All Storage Devices
Proprietary techniques so advanced we rescue data others simply abandon.

DRIVE SAVERS

Restoring data since 1985

1-800-440-1904

415-883-4232

Inquiry 461.

The Leader in Data Recovery

- Expertise in virtually every operating system & media storage device.
- 24-Hour support & emergency services available.
- Call for a FREE consultation!

ONTRACK DATA RECOVERY

MN: 1-800-872-2599 • CA: 1-800-752-7557

DC: 1-800-650-2410 • Europe: +44 1372 741999

Inquiry 462.

DATA RECOVERY when I.T. Matters

- Tape, Optical or C.D. Media
- Accidental Overwrites
- Hardware or Software Failure

VOGON

Europe Tel +44 (0) 118-989-0042
Fax +44 (0) 118-989-0040
USA Tel 405-321-2585 Fax 8242
Germany Tel +49 (0) 180-522-15-82
Fax +49 (0) 89-69-37-00-55

Inquiry 463.

DATA/DISK CONVERSION

CONVERSION/DUPPLICATION

Tape: 4MM, QIC, 8MM, DLT, 9-trk, 3480/90/90E

Disk: 3", 3 1/2", 5 1/4", 8" CD-ROM

1-800-357-6250

Shaffstall Corporation 317-842-2077
7901 East 88th Street Fax 317-842-8294
Indianapolis IN 46256 sales@shaffstall.com
Since 1973 <http://www.shaffstall.com>

Inquiry 464.

EDUCATION

B.S. & M.S. In COMPUTER SCIENCE

The American Institute For Computer Sciences offers an in-depth home study program to earn your Bachelor of Science at home. B.S. subjects covered are: MS/DOS, BASIC, PASCAL, C, C++, Data File Processing, Data Structures & Operating Systems. M.S. program includes subjects in Software Engineering and Artificial Intelligence. Ada and Using Windows courses also available. Accredited Member: World Association of Universities and Colleges.

AMERICAN INST. FOR COMPUTER SCIENCES

2101-BY Magnolia Ave., Suite 200, Birmingham, AL 35205

1-800-767-2427 • 1-205-323-6191

ENGINEERING SOFTWARE

ENTERPRISE WIDE VIEWING AND MARKUP

Use AutoVue Professional to view and mark up documents. Gain access to over 160 file formats from engineering, vector, raster, hybrid, wordprocessor, spreadsheet, database, fax, and more. Supported formats include AutoCAD DWG, MicroStation DGN, TIFF, Word, WordPerfect, Excel, and more. Available for Windows, DOS, and UNIX.

Cimmetry Systems Inc.

(800) 361-1904 Tel: 514-735-3219 Fax: 514-735-6440

Inquiry 465.

SCIENTIST®

FITS EQUATIONS TO DATA

FREE 30-day version available on the Web at <http://www.micromath.com>

MicroMath Scientific Software
1-800-942-6284 Fax (801) 943-0299

Inquiry 466.

FOREIGN LANGUAGES

WORLD'S LANGUAGE CENTER

Automatic Translation with a push of the button Chinese, Japanese, Russian, 150 languages Dictionaries - Fonts - Learning - OCR etc. Best Prices • Best Service FREE CATALOG

TransLanguage Inc.

800-308-8883 Fax 714-279-9368
PO Box 18024, Anaheim Hills, CA 92807

Inquiry 467.

HARDWARE

Pre-Owned Electronics, Inc.™

THE Independent Provider, serving the Dealer, Professional, Corporate, Government, and Educational Buyer since 1985.

APPLE II® & MACINTOSH® SYSTEMS • PARTS • EXCHANGE REPAIRS

Call for a Catalog... 800-274-5343
Office: 617-778-4600 • FAX: 617-778-4848
125 MIDDLESEX TURNPIKE • BEDFORD, MA 01730

Inquiry 468.

HEWLETT-PACKARD

Buy - Sell - Trade

LaserJet	ColorPro
DeskJet	DraftPro
RuggedWriter	DraftMaster
Electrostatic Plotters	DesignJet

HP 9000 Workstations and Vectras also available.

Ted Dasher & Associates

Your Hewlett Packard Remarketing Specialist
Phone: (205) 591-4747 Fax: (205) 591-1108
(800) 638-4833 E-mail: sales@dasher.com

Inquiry 469.

HELP WANTED

* \$200 - \$500 WEEKLY *

Mailing travel brochures. No experience necessary. For information send a self-addressed stamped envelope to:

Internet Travel

P.O. Box 680610, Miami, FL 33268

Inquiry 470.

INTERNET

GAMELON® INTERNET FILES

<http://www.menai.com>

Build powerful, sophisticated programs with a fast OO persistent data software library that fits the architecture of the Internet. Gather lumpy Internet data or use the Internet for program-to-program data exchange. Object nesting, hyperlinking, indexing, transaction management, and more.

- Solaris, Windows 3.1, Windows 95/NT, OS/2 (ask for Mac, Linux)
- APIs for C++, C, Visual Basic & Delphi (ask for JAVA)

Menai Corporation

1010 El Camino Real, Suite 370, Menlo Park, California 94025
(800) 426-3566 (U.S.) or (415) 853-6450
FAX (415) 853-6453 E-mail: info@menai.com

Inquiry 471.

LANs

Little Big LAN

The most flexible network

- Peer to Peer LAN to 250 nodes
- \$75 total software cost, not per node!
- Link via serial, parallel, or Modems
- Also via Ethernet or Arcnet, or mix!
- Typically only 40k of RAM

Information Modes

817-387-3339 / P.O. Drawer F, Denton TX 76202
Fax 817-382-7407 Orders 800-628-7992

Inquiry 472.

PRINTING UTILITIES

DO YOU USE A XEROX LASER?

Do you want to print any Windows application on your Xerox 4135, 4890, 4090 etc? *If so then you need:-*
WinForm - Allows production of forms and multiple page documents from any Windows application - \$1480
WinFont - Produces a Xerox font to match any True Type font - \$1480

A z i o n

For details on these and our other products
Call +44 1799 531179 Fax +44 1799 530485

Inquiry 473.

PROGRAMMERS TOOLS

High-Speed xBASE Engine for Java...

C, C++, Visual Basic and Delphi programmers. Get multi-user compatibility with FoxPro, Clipper and dBASE files. CodeBase is portable between DOS, Windows and UNIX! Includes client/server option as well as data-aware custom controls and a visual report writer!

FREE 30 day test drive!

Call **Seiquer Software Inc.** for details.

Phone 403 437-2410 FAX 403 436-2999

Inquiry 474.

SECURITY

Az-TECH SOFTWARE, INC.

Leaders in Software Security

EVERLOCK Safe-D EVERKEY

Phone: (816) 776-2700 x310

Fax: (816) 776-8398 * Dept: SMG-310

Internet: www.az-tech.com

E-MAIL: sales@az-tech.com

Inquiry 475.

SECURITY

CRYPKEY SOFTWARE LICENSING SYSTEM

"Software Protection with NO hardware lock and NO disk key"

CrypKey is software copy protection that is:

- completely secure from any disk copy program
- perfect for CD-ROM or INTERNET distribution!
- cost effective, user friendly, and 100% guaranteed to satisfy!

CrypKey can increase your software sales:

- upsell options and levels of your software
- lease or demo your software by runs or time
- enable or upgrade your customers instantly by phone, fax or email!

New! unique Ready-To-Try feature upon install allows 1 trial period only per customer. **New!** unique Add-On feature - add more options, levels, runs or time to existing licenses. **New!** CrypKey Instant - protects in just 5 minutes with no source code changes.

CrypKey is completely compatible with MS-DOS, MS-Windows 3.x, Win32s, Win95, Win NT, and manages network licenses on all Novell and Microsoft operating system based networks. CrypKey is produced by Kenonic Controls Ltd. - software and engineering since 1972.

Kenonic Controls Limited

7175-12th Street South East

Calgary, Alberta, Canada T2H 2S6

(403) 258-6200 • fax: (403) 258-6201

INTERNET: crpkey@kenonic.com

WEB: <http://www.kenonic.com/crypkey.htm>

Inquiry 477.

Cop's CopyLock II

Professional software protection.

DOS, OS2, Win 3.1, Win 95, NT, Networks.

CD-ROM and Internet Security.

Known and used world-wide since 1984.

www.linkdata.com

LINK Data Security

Int'l: + 45 3123-2350 Fax: + 45 3123-8448

Inquiry 477.

CRYPTO-BOX™ locks in your profits!

The Marx CRYPTO-BOX is the result of 10 years

experience in effective software protection.

- microprocessor controls ID codes, memory, dynamic algorithm and high speed data encryption
- remote access to passwords and counters
- license metering in networks: single key per LAN

MARX International, Inc.

See us at COMDEX in Las Vegas Microsoft Partner Pavilion #806

404-321-3020 1-800-MARX-INT fax: 404-321-0760

Visit our Home Page: <http://www.marx.com>

Inquiry 478.

KEY-LOK II™ SECURITY

Software Piracy Prevention - Survival 14 years proves

effectiveness. Active algorithm, programmable memory,

counters, date control, remote update. No ID on device.

Low pricing (e.g. \$16.50 each for 5).

No startup costs.

Also, ACCESS CONTROL systems and disk drive/system LOCKS

MICROCOMPUTER APPLICATIONS, INC.

3167 E. Otero Circle, Littleton, CO 80122

<http://www.csn.net/keylok>

1-800-453-9565 (303) 770-1917 FAX: (303) 770-1863

Inquiry 479.

SECURE!

- Your Software Security & Information
- Your Hardware - Inside & Out

Buy the Best PC Hardware "Rail Lock".

Lock PC Anywhere (can be used to hang the PC to wall/side/under table top)

FAX: USA (818) 592-0367 UK (171) 734-6396

ISRAEL (7) 6899 843

noble@netvision.net.il <http://www.noble.co.il>

Inquiry 480.

SOFTWARE/DEVELOPMENT

ADVANCED DEVELOPMENT TOOLKITS

EDAT

Cimmetry System's Engineering Data Access Technology (EDAT) provides programmers with complete access to CAD drawing information. Use EDAT to read, query, write and modify AutoCAD DWG, DXF, and MicroStation DGN formats. EDAT is available on Windows, Win 32s, UNIX and DOS.

VCET

View enable your application with VCET (Viewing and Conversion Enabling Technology), the most extensive viewing libraries. Add viewing capabilities for over 160 file formats within your Windows application in a matter of hours. The same technology used in AutoVue and other leading viewing and document management software.

Cimmetry Systems Inc.

(800) 361-1904 Tel: 514-735-3219 Fax: 514-735-6440

Inquiry 481.

SOFTWARE/ENGINEERING

Analog/Digital Simulation!!

- Windows, NT, DOS
- Power Mac, Macintosh
- IsSPICE4 Real Time SPICE
- Mixed Mode Simulation
- Schematic Entry
- New AHDL Modeling Kit!!
- Model Libraries, RF, Power
- More Than 5000 parts
- Waveform Analysis
- Full SPICE programs starting at \$95. Complete systems, \$595-\$2595

P.O. Box 710 San Pedro, CA 90733-0710

(310)833-0710, FAX (310)833-9658

Call for your Free Demo and Information kit.

intusoft

Inquiry 482.

Super FILTER

Active + Passive + Digital + Switched Cap

- ◆ LP, HP, BP, All pass and Notch ◆ 175+ Topologies
- ◆ All conventional types ◆ Cascade up to 5 unique types
- ◆ Component & Non-Ideal OpAmp parameters specified
- ◆ Plots of Group Delay, Gain, Phase, in Frequency or Time Domain ◆ Best fit of unknown w/Filter recognizer ◆ Monte Carlo/Sensitivity analysis ◆ \$498

Tatum Labs, Inc.

1287 N. Silo Ridge Drive, Ann Arbor, MI 48108

313-663-8810

FAX 313-663-3640

Inquiry 483.

SOFTWARE/GRAPHICS

The Next Generation of Imaging Tools™

ImageGear™ 6.0

AccuSoft announces the new standard in imaging toolkits, ImageGear™ 6.0, the successor to the top-selling AccuSoft Image Format Library™.

New Features include:

- ◆ Over 45 Raster Image Formats!
- ◆ Fastest JPEG, Group 3/Group 4
- ◆ Over 100 new API functions
- ◆ Available for all platforms
- ◆ New GUI functions
- ◆ Faster image display & transparency
- ◆ Display with sub-pixel accuracy
- ◆ Advanced image processing
- ◆ Faster image compression
- ◆ New display features, effects, and more!

AccuSoft Corporation

Call (800) 525-3577

www.accusoft.com

TEL (508) 898-2770 / FAX (508) 898-9662 Dept. BM4

2 Westborough Business Park Westborough, MA 01581 USA

Inquiry 484.

International Marketers: CAPTURE YOUR SHARE OF THE WORLDWIDE IT MARKET!

Now you can reach millions of buyers for your products through the Global Ad Network of 38 leading computer publications across the globe!

Call

Global Ad-Net

603-876-4311

Fax: **603-876-4196**

Inquiry 485.

SOFTWARE PACKAGING

FREE SOFTWARE PACKAGING CATALOG

Everything you will need to Package, Distribute, and Ship Your Software!! From manuals and binders to mailers and shippers

LABELS • LABELS • LABELS

For your diskettes, plain or custom printed dot matrix or laser printer... free samples

...FREE CATALOG...

Hice & Associates

8586 Monticello Dr., West Chester, OH 45069

Phone/Fax: 513-779-7977

Inquiry 486.

WINDOWS

FREE INTERNET

Free PPP, Get On-Line Immediately, Telnet to other BBS's, Surf the World Wide Web, 28.8k modems

1-409-633-6000

All You Pay For Is The Call

Inquiry 487.

YOUR AD HERE

ADD IMPACT WITH COLOR IN THE BUYER'S MART!!

Attract the attention of your customers with the addition of color to your ad.

Call

Vivian Bernier today at 603-924-2521

for rates and details to start or upgrade your advertising today!

OR FAX 603-924-2683

There Are 275,000 Good Reasons to Advertise in the BYTE Deck!

The BYTE Deck mails to a select group of **275,000 BYTE subscribers** who are proven direct market buyers.

In fact, BYTE subscriber surveys show that many readers prefer to buy through the mail order/direct channel:

Direct Channel Preference for Purchases of:

Peripherals 83%

Computer Systems 81%

Software 79%

Networking 65%

Source: 1995-1996 Subscriber Study

The average BYTE reader influences the purchase decisions of **107 others**, works in a company with more than **1,000 employees**, and influences **more computer product purchases** than any other person in his/her organization. The BYTE readership provides quality leads. **Why settle for anything less?**

Call Brian Higgins today at (603) 924-2596 or fax your order to (603) 924-2683.

BYTE DECK

Circle 488 on Inquiry Card.

ADVERTISER CONTACT INFORMATION

To order products or request free information, call advertisers directly or send in the Direct Link Card by mail or fax! **Let them know you saw it in BYTE!**

INQUIRY NO.	PAGE NO.	PHONE NO.	INQUIRY NO.	PAGE NO.	PHONE NO.	INQUIRY NO.	PAGE NO.	PHONE NO.
A			D			M		
82-83	ACI	188 888-618-6188	704-705	CYBEX COMPUTER PRODUCTS CORP	CVI 205-430-4000	709-710	MAGIC/MSE	48IS 6 +972-3-538-9292
92	ADVANCED IMAGE COMMUNICATIONS	191 510-947-1000	133-134	CYBEX COMPUTER PRODUCTS CORP	100 205-430-4000	749-750	MAINPOWER ELECTRONICS	48IS 22 +886-2-918-0657**
109-110	AE HOME CORPORATION	193 818-961-2499	198-199	CYBEX COMPUTER PRODUCTS CORP	173 205-430-4000	*	MCGRAW HILL BOOK COMPANY	24-25 +44 0162823432
121-122	ALADDIN SOFTWARE SECURITY INC	70 212-564-5678	E			723	MESSE MUENCHEN GMBH	48IS 5 +49-89-5107-506**
208	ALLMICRO INC	183 800-653-4933	*	DATA COMMUNICATIONS	46-47	207	MICRO 2000	174-175 800-864-8008
196	ALTEX COMPUTERS & ELECTRONICS	176 800-531-5369	*	DATA COMMUNICATIONS	180	*	MICROGRAFX	61 800-877-3040
753-754	AMD	37	725-726	DBTEL	48IS 12 +886-2-268-1964**	*	MICRO INTERNATIONAL INC	192 800-967-5667
67	AMERICAN ADVANTECH	187 800-800-6889	135-136	DELTEC	166 800-335-8321	228	MICRON ELECTRONICS	CII-1 800-362-7306
105	AMERICAN ADVANTECH	190 800-800-6889	224-227	DISTINCT CORPORATION	104 408-366-8933	168	MICRON ELECTRONICS	40-41 800-486-2059
*	AMERICAN POWER CONVERSION	32A-B 800-800-4APC DPTA2	200	DISTRIBUTED PROCESSING TECH	172 407-830-5522	169	MICRON ELECTRONICS	74-75 800-723-2998
123	AMERICAN POWER CONVERSION	33 401-788-2797**	137	DOLCH COMPUTER SYSTEMS	121 800-995-7580	99	MICROPATENT	192 800-984-9800
*	AMERICAN POWER CONVERSION	72A-B 800-800-4APC DPTA2	118	DUNN SYSTEMS	195 800-486-DUNN ext 405	*	MICROSOFT CORPORATION	2-3
124	AMERICAN POWER CONVERSION	73 401-788-2797**	F			*	MICROSOFT CORPORATION	28-29
165-166	ANDATACO	147 619-453-9191 ext 99	729-730	E-TECH	48IS 23 +886-35-777751**	*	MICROSOFT PRESS INC	103 800-MSPRESS
119-120	ANDREW CONSORTIUM-SCS	194 412-268-6710	706-707	EUTRON	48IS 9 +39-35 201003	*	MICROWAY	131 508-746-7341
*	ANTHRO CORP	158 800-325-3841	G			69	MINICOM/CLASSNET VIDEO	188 +972-2-518593
*	APPLE COMPUTER INC	16-18 408-996-1010	138	FAIRCOM CORPORATION	164 314-445-6833	*	MINITAB INC	141 814-238-3280
79-80	APPRO INTERNATIONAL INC	188 800-927-5464	179	FIELDWORKS	160 612-947-0856	711-712	MINUTEMAN	48IS 8 214-446-7363
180	ARTECON	106 800-872-2783	175-176	FINSON	151 +39-2-6698-7036	213	MIPS DATALINE AMERICA INC	184 619-679-4070
735-736	ATRIE	48IS 16 +886-2-999-4960**	737-738	FIRST INTERNATIONAL COMPUTER	48IS 2 +886-2-718-2782**	183-184	MIRO COMPUTER PRODUCTS AG	89 +49-531-2113-100
*	AVIATION WEEK	80-81	201-202	FIRST SOURCE INTL	181 714-448-7750	733-734	MITAC	48IS 24 +886-2-501-4265**
741-742	AVISION	39 +886-3-577-7017**	187	GEODESIC SYSTEMS	22 800-360-8388	731-732	MITAC	97 +886-2-501-4265**
84-85	AXIOM TECHNOLOGY	189 909-464-1881	192	GLOBETROTTER SOFTWARE INC	92 408-370-2800	65	MOXA TECH USA INC	187 800-699-MOXA
B			89-90	GRANITE DIGITAL	191 510-471-6442	181-182	MRT	155 +47 63 89 63 00
125-126	BEST POWER	99 608-565-7200	708	GREY MATTER LTD	48IS 27 +44-(0)1364-654200**	N		
127-128	BEST POWER	105 608-565-7200	747-748	GVC	87 +886-2-704-0338**	107	NATIONAL INSTRUMENTS	191 800-433-3488
129-130	BEST POWER	109 608-565-7200	H			*	NET2PHONE	111 201-828-2990
450	BIX	214 800-695-4775	*	HEWLETT PACKARD	51 800-322-HPCC ext 1557	*	NETWORLD+INTEROP	163 800-488-2883
*	BYTE	165 603-924-2663	114-115	HIWAY TECHNOLOGIES	194 800-339-HWAY	193	NRW	23 +49-211-837-2751**
*	BYTE	211 603-924-2663	I			148	NSTL	161 610-941-9600
*	BYTE BACK ISSUES	168 603-924-9281	86-87	ICP ACQUIRE	188 888-618-6188	194-195	NSTOR CORPORATION	118 800-724-3511
*	BYTE BEST OF SYSTEMS 96 AWARDS	48IS 29	*	IDT INTERNET	111 800-689-9438	O		
*	BYTE CUSTOMER SERVICE	162 +353-91-752-792	724	INFOCUS	11 +31-2356-23200	717	ON TIME MARKETING	48IS 20 +49-40-437472
*	BYTE EURODECK	85 603-924-2533	719-720	INNOVATIVE SOFTWARE	48IS 31 +49-69-236929	*	OSBORNE MCGRAW-HILL	52-53 800-822-8158
*	BYTE FIELD SALES	48IS 28 +353-91-752-793	230	INNOVUS MULTIMEDIA	148	P		
*	BYTE MOVING	22	74	INTEGRAND RESEARCH	189 209-651-1203	713	PERSOFT INC	CV 800-368-5283
*	BYTE MOVING	48IS 30	139	INTEGRIX INC	113 800-300-8288	149-150	PINNACLE MICRO	7 714-789-3000
*	BYTE ON CD ROM	213 800-924-6821	111-112	INTERNET SHOPPER	194 +44-(0)181 673 7422	151	PKWARE INC	45 414-354-8699
*	BYTE REPRINTS	135 603-924-2525	106	IO TECH	190 216-439-4091	203	POLYWELL SYSTEMS	179 800-300-7659
*	BYTE SUB MESSAGE	162	*	IOMEGA	69 888-2-IOMEGA ext 22	164	POWERSOFT	31 800-265-4555
*	BYTE SUB PROBLEMS	48IS 32	171-172	IQ SOFTWARE	12-13 800-458-0386	185-186	PRINCETON GRAPHIC SYSTEMS	54 714-751-8405
*	BYTE WEB SITE	205 http://www.byte.com/	J			223	PROTEC MICROSYSTEMS INC	156 514-630-5832
95-96	CALIFORNIA PC PRODUCTS INC	192 800-394-4122	103	JK MICROSYSTEMS	192 510-236-1151	Q		
93-94	CAMELEON TECHNOLOGY INC	192 800-440-7466	K			153	QNX EXPLR2	132 800-862-1883
170	CARDIFF SOFTWARE	167 800-659-8755	75	KILA	189 800-505-6749	152	QNX SOFTWARE SYSTEMS LTD	117 800-656-0566 ext 1027
167	CENTRAL DATA	143 800-482-0397	140-141	KINGSTON CPU UPGRADE	66 714-437-3334	104	QUALSTAR CORP	193 800-468-0680
73	CENTRAL TECHNOLOGIES	187 800-532-8054	142-143	KINGSTON STORAGE	21 714-435-2600	63-64	QUATECH INC	187 800-553-1170
701-702	COMPEX INC	15 714-630-7302	739-740	KUO FENG CORPORATION	48IS 18 +886-2-754-2829**	R		
197	COMPUTER DISCOUNT WAREHOUSE	170-171 800-959-4CDW	L			88	RACKMASTER	189 800-480-4384
*	COMPUTER PROFESSIONAL'S BOOK SOCIETY	152 614-759-3749**	209-210	LA TRADE	177 800-433-3726	714	RAD DATA COMMUNICATION LTD	83 +972-3-645-8107
703	COMPUTER QUICK	48IS 21 415-861-8330	116-117	LAHEY COMPUTER SYSTEMS	194 800-548-4778	214-215	RAIDTEC CORPORATION	184 770-664-8066
229	COMPUTERLANE UNLIMITED	185 800-526-3482	718	LANSOURCE TECHNOLOGY	48IS 11 416-535-3555	715-716	RAIMA CORP	48IS 17 206-557-0200
206	CONSAN INC	178 800-221-6732	91	LIBERTY SYSTEM INC	191 408-983-1127	154	RAINBOW TECHNOLOGIES	58 714-450-7300
132	COREL	138 613-728-0826 ext 3080				70-71	RCI	188 800-RCI-8090 ext 71
						77-78	RECORTEC INC	190 888-RECORTEC
						204-205	ROSE ELECTRONICS	186 800-333-9343
						155-156	ROSS TECHNOLOGY INC	159 800-774-ROSS

FREE PRODUCT INFORMATION

BYTE Advertisers Deliver the Information You Need - FAST!

YES! I want FREE product information from the following advertisers

Fill out this coupon carefully. Please print.

Name First Last

Title

Company

Address

City

State Zip

Phone

Fax

A. My company profile is best described as: (check one)

- ☐ 1 Corporate end user
- ☐ 2 Computer/communications manufacturer
- ☐ 3 Reseller/distributor/OEM/integrator/consultant
- ☐ 4 Other (please describe):

B. My job function is best described as: (check one)

- ☐ 5 Company Management
- ☐ 6 IS/MIS/IT Management
- ☐ 7 Systems Engineering/Integration
- ☐ 8 Departmental Management (non-IS/MIS)
- ☐ 9 Technical Services Support
- ☐ 10 Other (please describe):

C. My responsibilities require that I be involved with the following operating system environments: (check all that apply)

- ☐ 11 DOS
- ☐ 12 OS/2
- ☐ 13 Mac/OS
- ☐ 14 UNIX (any, including Solaris)
- ☐ 15 Windows
- ☐ 16 Windows/NT
- ☐ 17 NetWare
- ☐ 18 Other (please describe):

D. Please indicate which specific fields of interest are important to you: (check all that apply)

- ☐ 19 Mobile Computing
- ☐ 20 Application development
- ☐ 21 Client/Server
- ☐ 22 Internet/on-line
- ☐ 23 Video Conferencing
- ☐ 24 Multimedia
- ☐ 25 PC Telephony

E. Do you influence the purchase of the following products or services for your organization? (check all that apply)

- ☐ 26 Computers/peripherals
- ☐ 27 Software applications
- ☐ 28 Remote/wireless communications
- ☐ 29 LAN hardware or software
- ☐ 30 Internetworking hardware, software, or services

October 1996

90 97 99

Valid until December 31, 1996

Advertiser Inquiry Numbers

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136
137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153
154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187
188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204
205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238
239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272
273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289
290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306
307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323
324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357
358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374
375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391
392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408
409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425
426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442
443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459
460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476
477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493
494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527
528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544
545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561
562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578
579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595
596	597	598	599	600	701	702	703	704	705	706	707	708	709	710	711	712

713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729
730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746
747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763
764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797
798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814
815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831
832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848
849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865
866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882
883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899
900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916
917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933
934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967
968	969	970	971	972	973	974	975									

Editorial Inquiry Numbers

976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992
993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009
1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026
1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043
1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060
1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077
1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094
1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111
1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128
1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145
1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162
1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179
1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196
1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213
1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230
1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247
1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264
1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281

Product Category Information

To receive information for an entire category, circle the appropriate number in box above.

Hardware

Accessories/Supplies	1
Add-in Boards	2
Bar Coding	3
Communications/Networking	4
Computer Systems	5
Data Acquisition	6
Diagnostic Equipment	53
Disks & Optical Drives	7
Diskettes/Duplicators	8
Fax Boards/Machines	9

Graphics Tablets/Mice/

FREE PRODUCT INFORMATION

BYTE Advertisers Deliver the Information You Need – FAST!

A Division of The McGraw-Hill Companies



TNT MAILFAST
FRG/BOS/700252/MO1
P.O. BOX 66
HOUNSLOW
TW5 9RT
ENGLAND

PLACE
POSTAGE
HERE

FAST:

INQUIRE BY MAIL

Enter your name and address at right. Then circle the inquiry numbers that correspond to those on the advertisement or BYTE article, and mail this attached card.

FASTER:

INQUIRE BY FAX

Enter the information as described above then fax this card to:

416-620-979

FASTEST:

INQUIRE ON THE INTERNET

Access BYTE's home page at: www.byte.com and click on Free Product Information. Follow the instructions on-line.



ADVERTISER CONTACT INFORMATION

INQUIRY NO.	PAGE NO.	PHONE NO.	INQUIRY NO.	PAGE NO.	PHONE NO.	INQUIRY NO.	PAGE NO.	PHONE NO.
S			T			V		
174 SAG ELECTRONICS 57 508-682-0055			157 STATSOFT 95 918-749-1119			727-728 TRIDAT 481S 15 408-920-0656		
113 SCITECH INTERNATIONAL 194 800-898-9044			745-746 TAINET COMMUNICATION SYSTEM 481S 10 +886-2-658-3232			218-219 VCOMMUNICATIONS 182 800-648-8266		
721-722 SEH COMPUTERTECHNIK GMBH 481S 31 +49-521-94226-0			68 TALKING TECHNOLOGY INC 188 800-685-4884			66 VIDEIX INC 187 541-758-0521		
751-752 SEH COMPUTERTECHNIK GMBH 481S 32 +49-521-94226-0			158 TEKTRONIX 43 800-835-6100 ext 1314			162-163 VIEWSONIC 62 800-888-8583		
* SFD INC 8-9 415 827 7300			* TELE.COM 206-207			61-62 VIRTUAL REALITY PUBLISHING 195 800-951-7100		
81 SILICONRAX 189 800-700-8560			102 TERN INC 193 916-758-0110			* WALKER, RICHER & QUINN 137 206-217-7100		
97-98 SLIGER DESIGNS 192 702-356-5595			* TEXAS MICROSYSTEMS INC 64A-B +0031-36-536-5595			211-212 WIBU SYSTEMS AG 182 +49-721-93172-22		
108 SOFTWARE SECURITY 193 203-656-3932**			177-178 TEXAS MICROSYSTEMS INC 65 +0031-36-536-5595			Z		
216-217 SOFTWARE SYSTEMS 186 415-896-0708			159 TOSHIBA AMERICA INC 34-35 800-457-7777			100 Z-WORLD ENGINEERING 193 916-757-3737		
72 STARTECH COMPUTER PRODUCTS 187 800-265-1844 ext 231			160-161 TRAVELING SOFTWARE 122 800-224-7704			101 Z-WORLD ENGINEERING 193 916-757-3737		
			76 TRI VALLEY TECHNOLOGY INC 190 510-447-2030					

BYTE ADVERTISING SALES STAFF

John M. Griffin, Vice President, Publisher, One Phoenix Mill Lane, Peterborough, NH 03458,
Tel: (603) 924-2663, (212) 512-2367, Fax: (603) 924-2683, jgriffin@mcgraw-hill.com

NEW ENGLAND

CT, MA, ME, NH, NY, RI, VT,
Ontario, Canada, Eastern Canada
John Ferraro (617) 860-6221,
(212) 512-2555
jferraro@mcgraw-hill.com
Jeanne Beeson (617) 860-6349
jbeeson@mcgraw-hill.com
The McGraw-Hill Companies
24 Hartwell Avenue
Lexington, MA 02173
FAX: (617) 860-6307

NEW YORK

NY Metro, NJ
Michael Feinberg (212) 512-4811
feinberg@mcgraw-hill.com
Jill Pollak (212) 512-3585
jpollak@mcgraw-hill.com
The McGraw-Hill Companies
1221 Avenue of Americas—28th Floor
New York, NY 10020
FAX: (212) 512-2075

SOUTHWEST, ROCKY MOUNTAIN

AL, AR, LA, MS, OK, TN, TX
Bert Pangniban (214) 688-5165
bertpang@mcgraw-hill.com
Brian Higgins (603) 924-2596
bhiggins@mcgraw-hill.com
The McGraw-Hill Companies
Mockingbird Towers
Ste. 1104E
1341 W. Mockingbird Lane
Dallas, TX 75247-4943
FAX: (214) 688-5167

MID ATLANTIC—SOUTHEAST NEW MEDIA/ONLINE PRODUCTS

DC, DE, FL, GA, KY, MD, NC, PA, SC, VA, WV
Neil Helms (770) 242-6298
nhelms@mcgraw-hill.com
Paul Franchak (614) 899-4912
franchak@mcgraw-hill.com
The McGraw-Hill Companies
6050 Peachtree Pkwy.
Suite 340-191
Norcross, GA 30092
FAX: (770) 409-9622

CENTRAL U.S.

IA, IL, IN, KS, MI, MN, MO, ND, NE, OH,
SD, WI
Lori Silverstein (614) 899-4908
lorisf@mcgraw-hill.com
Paul Franchak (614) 899-4912
franchak@mcgraw-hill.com
The McGraw-Hill Companies
921 Eastwind Drive, Suite 118
Westerville, OH 43081
FAX: (614) 899-4999

SOUTH PACIFIC

AZ, Southern CA, CO, NM, NV
Beth Dudas (714) 753-8140
bdudas@mcgraw-hill.com
Emily Ospenson (714) 753-8140
ospenson@mcgraw-hill.com
The McGraw-Hill Companies
15635 Alton Pkwy., Suite 290
Irvine, CA 92718
FAX: (714) 753-8147

NORTH PACIFIC

AK, Northern CA, HI, ID, MT, OR, Silicon
Valley, UT, WA, WY,
Western Canada
Roy J. Kops (415) 513-6861
rkops@mcgraw-hill.com
Susan Rastellini (415) 513-6951
srastell@mcgraw-hill.com
Lisa Farrell (415) 513-6862
lfarrell@mcgraw-hill.com
The McGraw-Hill Companies
1900 O'Farrell Street, Suite 200
San Mateo, CA 94403
FAX: (415) 513-6867

PETERBOROUGH, NH OFFICE:

Sales FAX: 603-924-2683
Advertising FAX: 603-924-7507

BUYERS MART

Mark Stone (603) 924-2533
stonem@mcgraw-hill.com
BYTE
One Phoenix Mill Lane
Peterborough, NH 03458

BYTE Deck

Brian Higgins (603) 924-2596
bhiggins@mcgraw-hill.com
BYTE
One Phoenix Mill Lane
Peterborough, NH 03458

EURO-DECK

Mark Stone (603) 924-2533
stonem@mcgraw-hill.com
BYTE
One Phoenix Mill Lane
Peterborough, NH 03458

INTERNATIONAL ADVERTISING SALES STAFF

L. Bradley Browne, International Sales Director, One Phoenix Mill Lane, Peterborough, NH 03458,
Tel: (603) 924-2501, Fax: (603) 924-2602, bbrowne@mcgraw-hill.com

UNITED KINGDOM, BENELUX

Jonathan McGowan
jonmccgow@mcgraw-hill.com
The McGraw-Hill Companies
34 Dover St.
London W1X 4BR
England
Tel: +44 171 495 6781
FAX: +44 171 495 6734

GERMANY, SWITZERLAND, AUSTRIA

Jürgen Heise
jheise@mcgraw-hill.com
The McGraw-Hill Companies
Emil von Behring Strasse 2
D-60439 Frankfurt
Germany
Tel: +49 69 5801 140
FAX: +49 69 5801 145

ITALY, FRANCE, SPAIN, PORTUGAL, SCANDINAVIA

Zena Coupé, Amanda Blaskett
101645.1710@compuserve.com
A-Z International Sales Ltd.
70 Chalk Farm Road
London NW1 8AN
England
Tel: +44 171 2843171
FAX: +44 171 2843174

ISRAEL

Dan Aronovic
rhodanny@actcom.co.il
DARA International
41 Ravutski
Ra'anana 43220
Israel
Tel: +972-9-7419544
FAX: +972-9-7481934

JAPAN

Hirokazu Morita
Japanese Advertising
Communications, Inc.
Three Star Building
3-10-3 Kanda Jimbocho
Chiyoda-ku, Tokyo 101 Japan
Tel: +81 3 3261 4591
FAX: +81 3 3261 6126

BYTE ASIA-PACIFIC AUSTRALIA, HONG KONG, INDIA, INDONESIA, KOREA, MALAYSIA, PAKISTAN, PHILIPPINES, OTHER ASIA AND PACIFIC COUNTRIES, SINGAPORE, TAIWAN

Weiyee In
weiin@mcgraw-hill.com
Jennifer Chen
jennchen@mcgraw-hill.com
#305 Nanking East Road, Section 3,
10th floor
Taipei, Taiwan, R.O.C.
Tel: +886-2-715-2205
FAX: +886-2-715-2342

Subscription Customer Service

U.S. 1-800-232-2983
Outside U.S. +1-609-426-7676

For a New Subscription

U.S. 1-800-257-9402
Outside U.S. +1-609-426-5526

INDEX TO ADVERTISED PRODUCTS

For free product information from individual advertisers, circle the corresponding inquiry numbers on the response card!

To receive information for an entire product category, circle the category number on the response card!

CATEGORY NO. INQUIRY NO.	PAGE NO.	CATEGORY NO. INQUIRY NO.	PAGE NO.	CATEGORY NO. INQUIRY NO.	PAGE NO.
HARDWARE					
2 ADD-IN BOARDS		203 POLYWELL SYSTEMS	179	731-732 MITAC	97
84-85 AXIOM TECHNOLOGY	189	88 RACKMASTER	189	159 TOSHIBA AMERICA INC	34-35
93-94 CAMELEON TECHNOLOGY INC	192	77-78 RECORTEC INC	190	160-161 TRAVELING SOFTWARE	122
607-608 DARIM	88NA 2	174 SAG ELECTRONICS	57	727-728 TRIDAT	48IS 15
* MICROWAY	131	81 SILCONRAX	189	601 WINBOOK COMPUTER CORPORATION	11
65 MOXA TECH USA INC	187	177-178 TEXAS MICROSYSTEMS INC	65		
63-64 QUATECH INC	187	76 TRI VALLEY TECHNOLOGY INC	190	14 MAIL ORDER	
3 BAR CODING		727-728 TRIDAT	48IS 15	196 ALTEX COMPUTERS & ELECTRONICS	176
66 VIDEX INC	187	6 DATA ACQUISITION		197 COMPUTER DISCOUNT WAREHOUSE	170-171
4 COMMUNICATIONS/ NETWORKING		105 AMERICAN ADVANTECH	190	15 MEMORY/CHIPS/UPGRADES	
196 ALTEX COMPUTERS & ELECTRONICS	176	84-85 AXIOM TECHNOLOGY	189	753-754 AMD	37
67 AMERICAN ADVANTECH	187	106 IO TECH	190	93-94 CAMELEON TECHNOLOGY INC	192
735-736 ATRIE	48IS 16	107 NATIONAL INSTRUMENTS	191	201-202 FIRST SOURCE INT'L	181
73 CENTRAL TECHNOLOGIES	187	63-64 QUATECH INC	187	140-141 KINGSTON CPU UPGRADE	66
701-702 COMPEX INC	15	53 DIAGNOSTIC EQUIPMENT		209-210 LA TRADE	177
229 COMPUTERLANE UNLIMITED	185	208 ALLMICRO INC	183	155-156 ROSS TECHNOLOGY INC	159
139 INTEGRIX INC	113	207 MICRO 2000	174-175	16 MISCELLANEOUS HARDWARE	
69 MINICOM/CLASSNET VIDEO	188	7 DISK & OPTICAL DRIVES		109-110 AE HOME CORPORATION	193
223 PROTEC MICROSYSTEMS INC	156	165-166 ANDATACO	147	* ANTHRO CORP	158
714 RAD DATA COMMUNICATION LTD	83	180 ARTECON	106	95-96 CALIFORNIA PC PRODUCTS INC	192
70-71 RCI	188	206 CONSAN INC	178	97-98 SLIGER DESIGNS	192
204-205 ROSE ELECTRONICS	186	725-726 DBTEL	48IS 12	17 MODEMS & MULTIPLEXORS	
72 STARTECH COMPUTER PRODUCTS	187	89-90 GRANITE DIGITAL	191	735-736 ATRIE	48IS 16
745-746 TAINET COMMUNICATION SYSTEM	48IS 10	* IOMEGA	69	725-726 DBTEL	48IS 12
68 TALKING TECHNOLOGY INC	188	142-143 KINGSTON STORAGE	21	729-730 E-TECH	48IS 23
5 COMPUTER SYSTEMS		91 LIBERTY SYSTEM INC	191	605-606 NEWCOM	88NA 5
82-83 ACI	188	149-150 PINNACLE MICRO	7	18 MONITORS & TERMINALS	
* APPLE COMPUTER INC	16-18	9 FAX BOARDS/MACHINES		747-748 GVC	87
79-80 APPRO INTERNATIONAL INC	188	92 ADVANCED IMAGE COMMUNICATIONS	191	739-740 KUO FENG CORPORATION	48IS 18
84-85 AXIOM TECHNOLOGY	189	605-606 NEWCOM	88NA 5	733-734 MITAC	48IS 24
* COMPAQ	24-25	12 LAN HARDWARE		731-732 MITAC	97
* DELL COMPUTER CORP	88NA 6-7	109-110 AE HOME CORPORATION	193	185-186 PRINCETON GRAPHIC SYSTEMS	54
* DELL COMPUTER CORP	CV-CVI	704-705 CYBEX COMPUTER PRODUCTS CORP	CVI	745-746 TAINET COMMUNICATION SYSTEM	48IS 10
* DELL COMPUTER CORP	CVII-CVIII	133-134 CYBEX COMPUTER PRODUCTS CORP	100	162-163 VIEWSONIC	62
* DELL COMPUTER CORP	87	198-199 CYBEX COMPUTER PRODUCTS CORP	173	19 MULTIMEDIA/CD-ROM	
* HEWLETT PACKARD	51	201-202 FIRST SOURCE INT'L	181	206 CONSAN INC	178
* IBM AS 400	83	718 LANSOURCE TECHNOLOGY	48IS 11	607-608 DARIM	88NA 2
86-87 ICP ACQUIRE	188	174 SAG ELECTRONICS	57	725-726 DBTEL	48IS 12
74 INTEGRAND RESEARCH	189	721-722 SEH COMPUTERTECHNIK GMBH	48IS 31	724 INFOCUS	11
139 INTEGRIX INC	113	751-752 SEH COMPUTERTECHNIK GMBH	48IS 32	99 MICROPATENT	192
75 KILA	189	727-728 TRIDAT	48IS 15	183-184 MIRO COMPUTER PRODUCTS AG	89
228 MICRON ELECTRONICS	CII-1	13 LAPTOPS & NOTEBOOKS		181-182 MRT	155
168 MICRON ELECTRONICS	40-41	229 COMPUTERLANE UNLIMITED	185	20 PRINTERS/PLOTTERS	
169 MICRON ELECTRONICS	74-75	* DELL COMPUTER CORP	97	741-742 AVISION	39
* MICROWAY	131	137 DOLCH COMPUTER SYSTEMS	121	229 COMPUTERLANE UNLIMITED	185
733-734 MITAC	48IS 24	179 FIELDWORKS	160	721-722 SEH COMPUTERTECHNIK GMBH	48IS 31
731-732 MITAC	97	737-738 FIRST INTERNATIONAL COMPUTER	48IS 2	158 TEKTRONIX	43
148 NSTL	161	724 INFOCUS	11	21 PROGRAMMABLE HARDWARE	
		* MICRO-INTERNATIONAL, INC.	192	103 JK MICROSYSTEMS	192
		733-734 MITAC	48IS 24	102 TERN INC	193

INDEX TO ADVERTISED PRODUCTS

CATEGORY NO. INQUIRY NO.	PAGE NO.	CATEGORY NO. INQUIRY NO.	PAGE NO.	CATEGORY NO. INQUIRY NO.	PAGE NO.
100 Z-WORLD ENGINEERING	193	709-710 MAGIC/MSE	48IS 6	41 SECURITY	
101 Z-WORLD ENGINEERING	193	31 ENGINEERING/SCIENTIFIC		121-122 ALADDIN SOFTWARE SECURITY INC	70
56 RAID DRIVE ARRAYS		717 ON TIME MARKETING	48IS 20	118 DUNN SYSTEMS	195
109-110 AE HOME CORPORATION	193	113 SCITECH INTERNATIONAL	194	706-707 EUTRON	48IS 9
165-166 ANDATACO	147	33 GRAPHICS		* IBM CAPABILITIES	37
200 DISTRIBUTED PROCESSING TECH	172	132 COREL	138	* IBM CAPABILITIES	39
139 INTEGRIX INC	113	* MICROGRAFX	61	154 RAINBOW TECHNOLOGIES	58
194-195 NOSTOR CORPORATION	118	213 MIPS DATALINE AMERICA INC	184	211-212 WIBU SYSTEMS AG	182
214-215 RAIDTEC CORPORATION	184	35 MAIL ORDER		43 SOFTWARE DUPLICATION	
174 SAG ELECTRONICS	57	197 COMPUTER DISCOUNT WAREHOUSE	170-171	715-716 RAIMA CORP	48IS 17
52 SECURITY		703 COMPUTER QUICK	48IS 21	45 UNIX	
121-122 ALADDIN SOFTWARE SECURITY	70	708 GREY MATTER LTD	48IS 27	119-120 ANDREW CONSORTIUM-SCS	194
154 RAINBOW TECHNOLOGIES	58	36 MATHEMATICAL/STATISTICAL		167 CENTRAL DATA	143
108 SOFTWARE SECURITY	193	* MINITAB INC	141	138 FAIRCOM CORPORATION	164
211-212 WIBU SYSTEMS AG	182	157 STATSOFT	95	216-217 SOWTAY SYSTEMS	186
23 TAPE DRIVES		37 MISCELLANEOUS SOFTWARE		* WALKER, RICHER & QUINN	137
165-166 ANDATACO	147	175-176 FINSON	151	46 UTILITIES	
741-742 AVISION	39	38 ON-LINE SERVICES		208 ALLMICRO INC	183
104 QUALSTAR CORP	193	* AMERICA ONLINE	ONSERT	207 MICRO 2000	174-175
24 UPS/POWER MANAGEMENT		450 BIX	214	151 PKWARE INC	45
123 AMERICAN POWER CONVERSION	33	604 COMPUSERVE	88NA 1	160-161 TRAVELING SOFTWARE	122
124 AMERICAN POWER CONVERSION	73	114-115 HIWAY TECHNOLOGIES	194	47 WINDOWS	
125-126 BEST POWER	99	* IBM CAPABILITIES	37	187 GEODESIC SYSTEMS	22
127-128 BEST POWER	105	* IBM CAPABILITIES	39	601 WINBOOK COMPUTER CORPORATION	11
129-130 BEST POWER	109	* IDT INTERNET	111	GENERAL	
135-136 DELTEC	166	* MICROSOFT CORPORATION	28-29	49 BOOKS/PUBLICATIONS	
749-750 MAINPOWER ELECTRONICS	48IS 22	* NET2PHONE	111	* BYTE ON CD ROM	213
711-712 MINUTEMAN	48IS 8	39 OPERATING SYSTEMS		* COMPUTER PROFESSIONAL'S BK SOC	152
55 VOICE TECHNOLOGY		* MICROSOFT CORPORATION	2-3	* DATA COMMUNICATIONS	180
73 CENTRAL TECHNOLOGIES	187	153 QNX EXPLR2	132	* DATA COMMUNICATIONS	46-47
605-606 NEWCOM	88NA 5	152 QNX SOFTWARE SYSTEMS LTD	117	* MCGRAW HILL BOOK COMPANY	24-25
SOFTWARE		218-219 VCOMMUNICATIONS	182	* MICROSOFT PRESS INC	103
25 BUSINESS		54 OS/2		* OSBORNE MCGRAW-HILL	52-53
170 CARDIFF SOFTWARE	167	* IBM OS/2 OPENS WINDOWS	15	* TELE.COM	206-207
175-176 FINSON	151	40 PROGRAMMING LANGUAGES/TOOLS		61-62 VIRTUAL REALITY PUBLISHING	195
602-603 LOTUS NOTES COMPONENT	85	118 DUNN SYSTEMS	195	51 MISCELLANEOUS	
27 COMMUNICATIONS/NETWORKING		138 FAIRCOM CORPORATION	164	* BYTE	165
73 CENTRAL TECHNOLOGIES	187	187 GEODESIC SYSTEMS	22	* BYTE	211
224-227 DISTINCT CORPORATION	104	192 GLOBETROTTER SOFTWARE INC	92	* BYTE BACK ISSUES	168
201-202 FIRST SOURCE INT'L	181	708 GREY MATTER LTD	48IS 27	* BYTE BEST OF SYSTEMS 96 AWARDS	48IS 29
* IBM CAPABILITIES	37	719-720 INNOVATIVE SOFTWARE	48IS 31	* BYTE CUSTOMER SERVICE	162
* IBM CAPABILITIES	39	230 INNOVUS MULTIMEDIA	148	* BYTE EURODECK	85
111-112 INTERNET SHOPPER	194	171-172 IQ SOFTWARE	12-13	* BYTE FIELD SALES	48IS 28
609-610 LOTUS INTERNOTES	135	116-117 LAHEY COMPUTER SYSTEMS	194	* BYTE MOVING	48IS 30
713 PERSOFT INC	CV	709-710 MAGIC/MSE	48IS 6	* BYTE REPRINTS	135
160-161 TRAVELING SOFTWARE	122	717 ON TIME MARKETING	48IS 20	* BYTE SUB MESSAGE	162
* WALKER, RICHER & QUINN	137	164 POWERSOFT	31	* BYTE SUB PROBLEMS	48IS 32
29 DATABASE		715-716 RAIMA CORP	48IS 17	* BYTE WEB SITE	205
138 FAIRCOM CORPORATION	164	* SFD INC	8-9	723 MESSE MUENCHEN GMBH	48IS 5
719-720 INNOVATIVE SOFTWARE	48IS 31	* WALKER, RICHER & QUINN	137	* NETWORL-DINTEROP	163
171-172 IQ SOFTWARE	12-13	211-212 WIBU SYSTEMS AG	182	193 NRW	23

EDITORIAL INDEX

For more information on any of the companies covered in articles, columns, or news stories in this issue, circle the appropriate inquiry number on the response card. Each page number refers to the first page of the article or section in which the company name appears.

INQUIRY NO.	PAGE NO.	INQUIRY NO.	PAGE NO.	INQUIRY NO.	PAGE NO.	INQUIRY NO.	PAGE NO.
A		979	Diamond Flower 157			S	
3Dfx Interactive 76		1068	Digital Equipment 114			S3 76	
3Dlabs 76		1050	Digital Semiconductor 56			Samsung Electronics 48IS 19	
Accent 48IS 7		E				1009	SBS Financial Systems 48IS 25
Acer 48IS 19		1008	Easy 48IS 25			1076	Sceptre Technologies 114
1051	Acer America 208	1012	Elonex 48IS 25			1032	Sega of America 208
990	Active Imaging 48IS 25	1002	Emulek 48IS 25			1001	Serverware Group 48IS 25
993	Adder Technology 48IS 25		Epson 26				ServiceSoft 26
1034	AdvanSys 208		EuroInternet 48IS 13			986	Siemens 48IS 25
	Advantage kbs 26	1036	Extended Systems 208			983	Siemens Nixdorf 149
	Alternic 26	F				984, 996	48IS 25
1061	Altura Computer Systems 114	995	Fibronics 48IS 25				SoftArc 26
	American Hytech 93	1043	Fujitsu Computer Products of America 208			1025	SoftShell International 208
1031, 1040	American Power Conversion 208	1046	Fujitsu PC Corp. 208				Sony DVD 139
1062	AMS-Tech 114	G				1048	Stac Electronics 145
	Artic Technologies 59		Ganymede Software 95			977	Strategic Studies Group 157
1042	AST Research, Inc. 208	1069	Gateway 2000 114				Sun 26
1005	Astarte 48IS 25		Globalink Europe 48IS 7				Syntha-Voice 59
	ATI Technologies 76	980	Grolier Interactive 157				Syquest 26
1063	Austin Computer Systems 114	H					SystemSoft 26
	Axis Communications 26	987	Hantz & Partner 48IS 25			T	
B		1059	HDS Network Systems 50				Tatung Co. 48IS 19
992	BinTec Communications 48IS 25	1070	Hewlett-Packard 26, 114			1038	TDK Systems 208
	Biolink 59	I				1077	Texas Instruments 114, 208
1044	Breece Hill Technologies 208	1071	IBM 114			1045	
C			IBM Europe 48IS 7			1018	The Database Solutions Co. 208
1007	Caere 48IS 25		ImageNet 93			1026	TopSpeed Corp. 208
	Calico Technology 93	1072	Impulse Computer 114			1078	Toshiba America 114
	Canon 26		Inference 26				Toshiba DVD 139
1064	Canon Computer Systems 114	1039	Infomaging Technologies 208				Trident Microsystems 76
	CenterLine Software 95	1015	Information Dimensions 208			U	
1029	CheckPoint Software Technologies 208	997	Integrated Measurement 48IS 25			989	US Robotics 48IS 25
1065	Chem USA 114	982	Iomega Corp. 26, 157			V	
1047	Cheyenne Software 145	1016	Island Way Corp. 208				v.Rheinbaden & Busch Electronic Publishing 48IS 7
	Chromatic Research 76	J					Venturcom 88NA 3
1060	Compaq Computer 114, 154		John Wiley and Sons 133				VideoLogic 76
1066		L					Visio 95
1028	Coordinate.com 208	1006	LeReseau Netzwerksystemen 48IS 25			981	Visioneer 157
1010	CSD Software 48IS 25		Lexmark 26			W	
	Cygnus Support 133	1017	Lighten 208				WebTV Networks 48IS 19
978	Cyrix Corp. 157		Logos 48IS 7			1080	Wedge Technology 114
D		1049	Lotus Development 14, 26, 49			1041	Wi-LAN 208
994	D-Link 48IS 25	M				1079	WinBook 114
1033	Data Translation 208	1003	Magic Software Enterprises 48IS 25			X	
1037	Dayna Communications 208						Xerox 14
1067	Dell Computer 114		Make Systems 93			1001	Xyratex 48IS 25
	DenMac 95		1030	Matrox Graphics. 76, 208			
			1022	McAfee 208			
			1019	McGraw-Hill Professional Book Group 208			
			1073	Micro-International 114			
			1024	Micro Logic 208			
				Microplex 26			
			1081	Microsoft 14, 26, 59, 71, 126, 208			
			1013				
				MicroTalk 59			
				MIL 3 93			
			1020	MindWorks 208			
			N				
				NEC Corp. 48IS 19			
			1074	NEC Technologies 114			
			1078	NetScene 48IS 25			
				NetSuite 93			
				Network Design and Analysis 93			
			1021	NewSoft 208			
			1075	Nimantics 114			
				Nippon Telegraph and Telephone 48IS 19			
				Novell 95			
				Nvidia 76			
			O				
				Oak Technologies 76			
			1023	On Technology 208			
			P				
				Phar Lap 88NA 3			
				Philips DVD 139			
				PinPoint 95			
			1014	Planet 208			
			985	Powersoft 153			
			976	Proxima 55			
			988	Purple Software 48IS 25			
			Q				
			1027	Quarterdeck 208			
			1035	Quick Technology 208			
				Quyen Software 95			
			R				
			991	RAD Data Communications 48IS 25			
				Rank Xerox Research Centre Grenoble 48IS 7			
			1004	Reich Technologies 48IS 25			
				Rendition 76			
				Rogue Wave Software 216			

IS pages appear only in the International edition.

The BYTE Site brings you today's hottest technologies with extended product and technology coverage that's the perfect complement to BYTE magazine.



THE **BYTE** SITE

<http://www.byte.com>

The World's Technology Authority Online!

■ The **BYTE** Archive

Two years of BYTE, more than 3,000 full-text articles, illustrations, and photos... all indexed for quick retrieval!

■ The **BYTE** Network Project

The BYTE Site... a living laboratory showcasing the best tools for building Web applications. Read about it in BYTE... try it out online!

■ The **Virtual Press Room**

Instant access to vendor press releases and white papers! Links to vendor web sites!

■ **BYTEMarks**

FREE Benchmark! Download the BYTEMark – the benchmark with teeth!

■ **Direct Access to Advertisers**

Contact Byte advertisers **DIRECTLY** through the online advertiser index!

BYTE

The **BYTE** Site. The World's Online Technology Authority.

A Division of The McGraw-Hill Companies





www.teledotcom.com

**A
SITE
TO BE
SEEN**

tele.com
The Web Edition

What's New

PREVIEW



Outlook 97 call for price

Microsoft Corp.
Redmond, WA
(800) 429-9400
(206) 882-8080
fax: (800) 727-3351
<http://www.microsoft.com>

Circle 1013 on Inquiry Card.

E-Mail Meets Personal Information Management

There's good news for those of you who spend a good portion of your day creating and responding to e-mail: Microsoft's Outlook 97 integrates e-mail with common business applications such as scheduling, PIMs, and word processing. Slated to ship by the end of the year, Outlook 97 lets you juggle tasks such as scheduling, basic contact management, and task delegation in one place, under one consistent interface (see the screen above).

Outlook 97 offers an immense number of new features. The primary benefit is that unlike Schedule+ (which this new program replaces), Outlook 97 provides a single store for e-mail and other information. For example, you can create an appointment in Outlook 97's calendar module by simply dragging an e-mail message into the calendar. Another timesaving feature, auto-preview, helps you prioritize e-mail reading by displaying only the first few lines of a message. Remote users can download just the header and subject of a message before downloading all its contents.

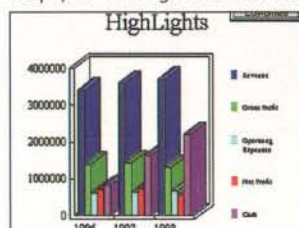
Outlook 97 includes several form templates to let you automate expense reports, vacation requests, and other activities; you can also create forms. The intuitive rules-creation module, slated to ship shortly after Outlook 97, lets you automate message responses. Based on my experience with Outlook 97, it is a fine implementation of the next step in the evolution of e-mail.

—Dave Andrews

Business

Enterprise-Wide Business Planning

TWO INTEGRATED PRODUCTS FOR WINDOWS help you manage and control



groups, departments, divisions, and entire companies. Business Maestro (\$995; Enterprise model, \$3995) provides tools for formal business and strategic planning, financial modeling and control, and managing the budget process. Business Maestro has data import and export facilities supporting a number of popular formats. Designed for cost centers, Budget Maestro (\$495; Enterprise model, \$1995) assists companies in bottom-up and top-down budgeting, and you can use it with Business Maestro.

Contact: Planet Corp., Worcester, MA, (800) 366-5111 or (508) 757-2840; planet@planet-corp.com. Circle 1014 on Inquiry Card.

Manage Documents Over the Web

AVAILABLE FOR UNIX AND WINDOWS NT, the Basis Intranet Solution lets you integrate enterprise-wide docu-



ment management applications with Web technology to develop intranets. The package includes links to business-critical applications, including policies and procedures, research information management, and competitive analysis; monitoring of security controls and operating logs; full-text search and retrieval; thesaurus-based search assistance; cross-repository queries; and the ordering of search results.

Contact: Information Dimensions, Inc., Dublin, OH, (800) 328-2648 or (614) 761-8083; <http://www.idi.oclc.org>. Circle 1015 on Inquiry Card.

Client/Server Project- Collaboration Tool

A CLIENT/SERVER APPLICATION THAT SUPPORTS TCP/IP- and NetWare-based IPX/SPX networking, TeamWay (per server, \$1000; per client, \$350)

Resource	Task Name
2 Cindy	Web Browser Prototype
3 TW 2.0	Save window settings
4 David	Multiple select
5 TW 2.0	Color select
6 TW 2.0	Admin
7 John	Archive
8 John	Set Permissions

delivers timely status information to individual team members and their managers. The product helps team members track personal responsibilities across projects, as well as manage nonproject obligations. The program schedules a project's component tasks based on each team member's constraints and updates everyone as changes occur in the project.

Contact: Island Way Corp., Wellesley, MA, (617) 235-6740; <http://www.islandway.com>. Circle 1016 on Inquiry Card.

This month, we preview Microsoft's Outlook 97, which replaces Schedule+, and Matrox Graphics' 64-bit Mystique PCI graphics board.

Build Business Models

A STAND-ALONE WINDOWS APPLICATION for creative business thinking, Advance 1.0 (\$695) helps you build business models and analyze multidimensional business data contained in corporate databases.

Contact: *Lighten, Inc.*, Berkeley, CA, (800) 398-4545 or (510) 528-4376; <http://www.lighten.com>.

Circle 1017 on Inquiry Card.

Database

Dynamic Database Management

A SUITE OF SOFTWARE TOOLS, TOTAL PERFORMANCE MANAGEMENT (tools, from \$2995; TPM Premium Package, \$25,000) proactively manages client/server database environments. You can use the product with Oracle, Sybase, or Microsoft SQL Server databases that use SQL*Net, SNMP, or Open Client.

Contact: *The Database Solutions Co.*, Richmond, VA, (800) 933-7668 or (804) 794-0354; <http://www.dbsol.com>.

Circle 1018 on Inquiry Card.

Engineering

Engineering Series on CD-ROM

MCGRAW-HILL'S INTERACTIVE ENGINEERING Calculations Series includes Civil Engineer's Solutions Suite (\$79.95), Chemical Engineer's Solutions Suite (\$89.95), and Architectural Engineer's Solutions Suite (\$69.95). The CD-ROMs include the text, tables,

graphs, and diagrams from corresponding sections of the original handbooks.

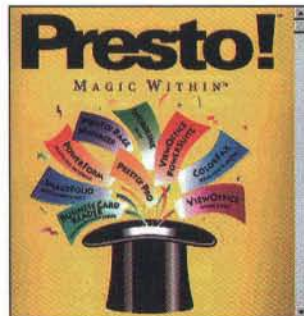
Contact: *McGraw-Hill Professional Book Group*, New York, NY, (800) 722-4726 or (212) 337-4097; <http://www.books.mcgraw-hill.com>.

Circle 1019 on Inquiry Card.

Imaging

Scanning OS for Desktop Imaging

BY PROVIDING A LINK BETWEEN A TWAIN- or Adobe Plug-In-compliant scan-



ner and desktop applications, the Presto PageManager Suite lets you drag and drop a scanned image to a printer, fax application, e-mail, filing system, OCR software, or word processor for further processing. Available for Windows and the Mac, the Presto PageManager Suite (about \$199) includes the scanning OS, an electronic filing system, OCR software, a color-image editor, business-card scanning software, forms, and a color-image-transmission system.

Contact: *NewSoft, Inc.*, Fremont, CA, (800) 214-7059 or (510) 252-0267; <http://www.tophat.com>.

Circle 1021 on Inquiry Card.

Share Images Over a Network

NOW, USERS ON NOVELL NETWARE 3.12 or higher LANs can store, manage, search, and share document images. Recollect LAN (server, \$2000; client, \$299 each) consists of Recollect Server, an NLM that provides centralized image storage and retrieval; the Recollect Scan and Search client module, which allows users to capture, retrieve, view, and organize documents on the server or their own PCs; and the Recollect Search client module, which allows users to retrieve, view, and organize Recollect documents.

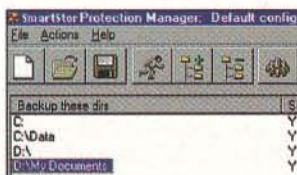
Contact: *MindWorks Corp.*, Sunnyvale, CA, (800) 683-8005 or (408) 730-2100.

Circle 1020 on Inquiry Card.

Networking

Windows 95 Backup Software

SMARTSTOR'S (\$65) INSTALLABLE FILE System feature uses a 32-bit VxD to establish a tape drive as a logical, mounted storage device, making it easier to view, back up, and restore data. Once you mount the system, you can access the tape drive just as you would any other



on-line storage device. SmartStor also lets you back up data to hard drives and optical drives anywhere on the network.

Contact: *McAfee*, Santa Clara, CA, (408) 988-3832;

<http://www.mcafee.com>.
Circle 1022 on Inquiry Card.

Internet Firewall Security

DESIGNED TO PROVIDE COMPUTER NETWORK security for medium- to large-size organizations with Internet or intranet exposure, On Guard



screens IP and IPX packets and rapidly compares the "state" of each packet against the firewall's rules base. If the traffic is not permissible or is unexpected, such as a hacker's attempt to spoof the firewall, On Guard drops the packets and issues an alert to the On Guard Manager workstation.

Contact: *On Technology Corp.*, Cambridge, MA, (800) 767-6683 or (617) 374-1400; <http://www.on.com>.

Circle 1023 on Inquiry Card.

Utilities

Make Space on Your Crowded Hard Disk

DISKMAPPERS (\$49.95) SHOWS YOU THE size of every file and subdirectory on your hard disk, as well as the filename, path, size, date, and extension type, so you can delete or compress files you don't need or rarely use. The utility for Windows 3.x and 95 also lets you launch programs or data files from DiskMapper.

Contact: *Micro Logic Corp.*, Hackensack, NJ, (800) 342-

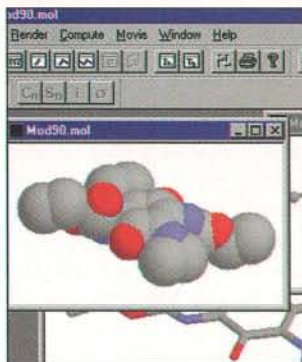
5930 or (201) 342-6518;
<http://www.miclog.com>.
 Circle 1024 on Inquiry Card.

Windows

Render Molecules, Calculate Symmetry

DESIGNED FOR DESKTOP VISUALIZATION AND publishing, SymApps (\$499) is a 3-D molecular rendering program for Windows 95 and NT that can calculate symmetry point groups and display the symmetry elements on-screen. You can calculate point groups over a range of tolerances to identify distortions in molecular coordinates and calculate char-

acter tables for symmetry point groups.
Contact: SoftShell International, Grand Junction, CO, (970) 242-7502;
<http://www.softshell.com>.
 Circle 1025 on Inquiry Card.



Software Updates

A RAD environment, Clarion for Windows 2.0 includes OOP enhancements to the Clarion 4GL language, OLE/OCX support, and new options for customizing application appearance. Professional Edition, \$599; Enterprise Edition, \$1499; Standard Edition, \$199.
Contact: TopSpeed Corp., Pompano Beach, FL, (800) 354-5444 or (954) 785-4555; <http://www.topspeed.com>.
 Circle 1026 on Inquiry Card.

HiJaak Pro 4.0 supports common 3-D graphics, PostScript, and CAD formats; supports graphics file operations, such as viewing, printing, and converting, from the shortcut menu; and integrates with the Windows 95 shell to expand graphics handling in the OS. About \$279.
Contact: Quarterdeck Corp., Marina del Rey, CA, (800) 282-0866 or (310) 309-3700; <http://www.quarterdeck.com/>.
 Circle 1027 on Inquiry Card.

BeyondMail 3.0 Internet Edition introduces directory services via a four-tier address book: personal, workgroup, enterprise, and global; multimedia messaging; information handling with configurable folders; remote-access enhancements; and messaging-administration enhancements. Call for prices.
Contact: Coordinate.com, Waltham, MA, (800) 567-8818 or (617) 398-7900; <http://www.coordinate.com>.
 Circle 1028 on Inquiry Card.

Enhancements in FireWall-1 2.1 include Internet and intranet gateway support for Windows NT, management console support for NT and 95, integrated support for FireWall-1 SecuRemote client-encryption software on Windows 95 laptops and desktops, and extended application support for RealAudio, VDOLive, Internet Phone, and Oracle SQL*Net. For up to 50 nodes, \$4990; for up to 250 nodes, \$9990; for unlimited nodes, \$18,900.
Contact: CheckPoint Software Technologies, Ltd., Redwood City, CA, (800) 429-4391 or (415) 562-0400;
<http://www.checkpoint.com>.
 Circle 1029 on Inquiry Card.

HARDWARE

Accessories

Notebook Surge Protector

THE SURGEARREST NOTEBOOK PROTECTOR (\$29.95) offers three telephone jacks—one phone in and two



modem/fax lines—and a 6-foot telephone cord. A thermal fuse disconnects the AC line if there is a sustained overvoltage.

Contact: American Power Conversion, West Kingston, RI, (800) 877-4080 or (401) 789-5735; <http://www.apcc.com>.
 Circle 1031 on Inquiry Card.

Net Link Internet Device

SEGA SATURN NET LINK (\$199.99), A 28.8-Kbps modem and browser



peripheral for the Sega Saturn, brings the Internet to your TV for networked gaming, e-mail, on-line chats, and Web connections. The modem plugs into the cartridge slot on the Sega Saturn, and the package has CD-ROM-based HTML 2.0-compatible Web-browser software developed specifically for the NTSC display standard.
Contact: Sega of America, Inc., Redwood City, CA, (800) 872-7342 or (415) 508-2800;
<http://www.sega.com>.
 Circle 1032 on Inquiry Card.

Add-Ins

Digital-Only PCI Frame Grabber

DESIGNED FOR DIGITAL CAMERAS, THE DT3157 Mach frame grabber (\$1495) can transfer images in real time to system memory or the display. Compatible with single- and dual-channel digital cameras with image size outputs as high as 4 MB and data transfer rates of up to 40 MBps, the board accepts 8-, 10-, 12-, 14-, and 16-bit digital images.
Contact: Data Translation, Marlboro, MA, (800) 525-8528 or (508) 481-3700;
<http://www.datx.com>.
 Circle 1033 on Inquiry Card.

PCI-Format SCSI Adapter for PC and Power Mac

USING ONLY A SIMPLE JUMPER TO SELECT PC or Power Mac capability, the AdvanSCSI ABP970 PCI Bus Host Adapter (\$199) includes a dedicated 50-MHz RISC processor chip with on-board SRAM that relieves the host CPU of I/O tasks through bus-mastering technology. The adapter can obtain data transfer rates of 133 MBps. It comes with Charisma's Anubis Power Mac drivers for hard disk and removable media, and Charisma's CD-ROM and recordable CD device drivers.
Contact: AdvanSys, Inc., San Jose, CA, (800) 525-7443 or (408) 383-9400;
<http://www.advansys.com>.
 Circle 1034 on Inquiry Card.

Motherboards

Improve Processor Speeds



THREE MOTHERBOARDS IMPROVE THE processor speeds and performance of



WHO DO YOU TRUST WITH THE TRANSMISSION
in your Teutonic sports coupe?
An expert mechanic or Ed from the corner Gulf station.
Your gall bladder?
A surgeon or some guy fresh from medical school.
Hmm. Tough choice.

Now imagine you're a business trying to cope in today's
"ever-so-wired" world. Sure, you know the problems and
opportunities. But which IT products offer the best
solutions is Greek to you.

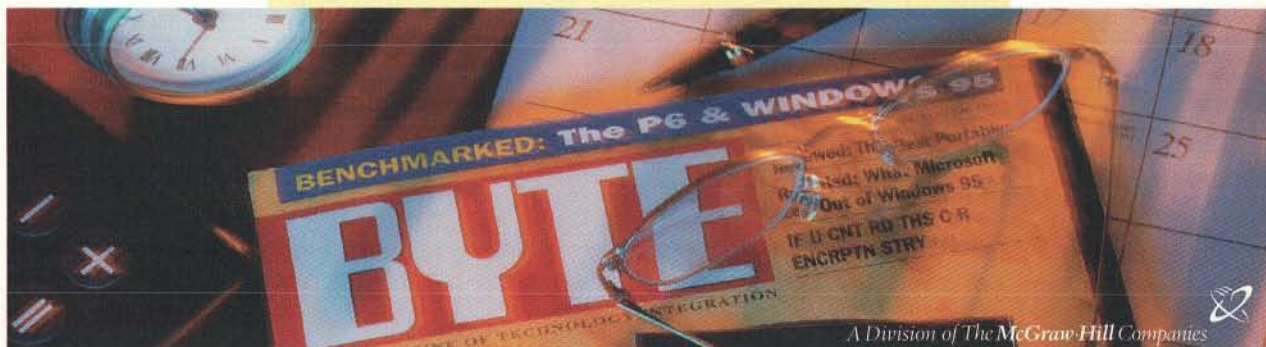
Once again, an expert is called for.

So you get him in your office (he works for you, after
all) and say, "Hey, this convergence of computing and
communications thing is driving me nuts. You're the
technology expert, find me some answers."

And he comes back a month or so later with all the
right solutions and products. And you say, "How did
you do that so fast?"

And the expert says, "BYTE."

And you wonder how much he knows about transmissions.



A Division of The McGraw-Hill Companies

Nearly one million computing experts worldwide read BYTE magazine every month. Because only BYTE delivers the global coverage and technical insights that illuminate Information Technology from problem through solution. That makes us something of an authority on the subject. And you something of a genius when you advertise in BYTE. For more information, call John Griffin, VP/Publisher at 603.924.2663. Or contact us at <http://www.byte.com>

THE GLOBAL AUTHORITY FOR COMPUTING TECHNOLOGY.

desktop systems in CAD/CAM and multimedia applications. Compatible with Intel Pentium and Cyrix CPUs, the P55TU (\$479) can support system speeds of up to 200 MHz and features Intel's 430HX chipset and the Adaptec Ultra Wide SCSI controller. The P55TU is also SCSI RAID bus slot-ready, so you

can add RAID functionality to your system, supporting RAID levels 0, 1, and 5. The P55TV (\$369) and P55TVS (\$399) provide most of the same features as the P55TU, but, instead, they are equipped with the Intel 430VX chip set and an Ultra SCSI controller.

Contact: Quick Technology

PREVIEW



Mystique
with 2 MB of SGRAM, \$199;
with 4 MB, \$279

Circle 1030
on Inquiry Card.

Matrox Graphics, Inc.
Dorval, Quebec, Canada
(800) 810-2550
(514) 969-6300
fax: (514) 969-6363
<http://www.matrox.com/mga>

Champagne Graphics at Beer Prices

PC graphics are entering a new era. For the price of almost any of yesterday's vanilla PCI graphics boards, today you can get swift 2-D graphics, impressive 3-D effects, and smooth video.

Engineers, stay calm. The Mystique won't fit the bill for a lot of CAD-type work, since it stops at a resolution of 1280 by 1024 pixels. Similarly, if you're a graphic artist who needs 3-D graphics with 32-bit color at the highest resolutions, look elsewhere.

However, more mainstream computer users will benefit from this 64-bit board's MGA-1064SG processor and fast memory. MPEG software decoding performance is very smooth. I ran the Mystique, with late beta drivers, through NSTL's lmark video suite, and it dropped no frames in any of the video tests. As for 3-D, whether the application is a game, training, or a simulation, results will be impressive. A peek at upcoming games based on Microsoft's Direct3D reveals that features such as perspective-correct texture mapping and shading add a great deal of realism to animated scenes.

While beta drivers prevented me from making accurate comparisons with Matrox's older MGA Millennium line, I expect the Mystique to outperform it and most other midpriced graphics boards (including some 128-bit ones) with previous-generation chips.

—Mark Schlack

Corp., Tustin, CA, (714) 258-4500; quick8@ix.netcom.
Circle 1035 on Inquiry Card.

Networking

Wireless Infrared Token Ring Adapter

NOW, YOU CAN CONNECT YOUR PORTABLE PC to Token Ring networks using JetEye Net Plus (\$719). The adapter supports IrDA data transfer standards of up to 4 Mbps; supports IPX, TCP/IP, and NetBEUI; and allows you to roam between Token Ring and Ethernet networks without reconfiguring your portable.

Contact: Extended Systems, Boise, ID, (800) 235-7576 or (208) 322-7800;

<http://www.extendsys.com>.

Circle 1036 on Inquiry Card.

100Base-TX LAN PC Card

MEETING THE 32-BIT CARDBUS PC CARD standard, the Network Flyer 100 (\$329) is eight times faster than 10Base-T mode. The Ethernet PC



Card offers 10Base-T and 100Base-TX LAN solutions and is optimized for low power consumption. The LAN Adapter PC Card comes with ODI and NDIS drivers, allowing for fast connections to popular NOSes. Contact: TDK Systems, Nevada City, CA, (800) 999-4835 or (916) 478-8421; tdkpr@tsd.ssi1.com.

Circle 1038 on Inquiry Card.

10Base-T-to-100Base-T LAN Bridge

SINGLE-PORT BRIDGE USERS CAN CONNECT their 10Base-T-only devices to Fast Ethernet LANs. The BlueStreak Fast EtherPrint 10/100 (about \$395)

offers plug-and-play functionality requiring no software setup or hardware configuration, protocol-independent bridging from 10- to 100-Mbps Ethernet, an RJ-45 jack for 100Base-T and 10Base-T connections, a reset switch, and diagnostic LEDs for link, transmit, and receive.

Contact: Dayna Communications, Inc., Salt Lake City, UT, (800) 531-0600 or (801) 269-7200; <http://www.dayna.com>.

Circle 1037 on Inquiry Card.

Peripherals

Personal Fax Server

CONSISTING OF AN EXTERNAL FAX/MODEM card and a memory chip set, which comes with 512 KB of RAM (expandable to 4.2 MB), 3D FaxPal (\$169) captures faxes from a telephone line and stores them (up to 20 faxed pages) for later retrieval from a PC. You can transmit faxes at 14.4 Kbps and receive them at 9.6 Kbps. You can convert a fax machine into a printer and scanner.

Contact: InfoImaging Technologies, Inc., Palo Alto, CA, (800) 966-1140 or (415) 960-0100; <http://www.infoimaging.com>.
Circle 1039 on Inquiry Card.

Power Protection for Workstations

NOW, YOU CAN COMBAT HARDWARE DAMAGE caused by surges and data loss from brownouts and blackouts. The Back-UPS Office (\$179) multipath power device offers six outlets with multistage surge suppression and EMI/RFI filtering, phone-line protection for Internet users, network



data-line protection for workstations, and battery backup for CPUs.

continued

The Definitive Reference Source!



5 Years of BYTE
1991-1995

Call 1-800-924-6621

PLUS: Quarterly Updates with Every Issue in 1996

SEARCH ▼

EXPORT ▼

FIND ►



Instant Access
To More Than
60 Issues of
BYTE

It's all at your fingertips—
emerging trends, comprehensive world-wide industry

analysis, multiplatform coverage of all the technologies, in-depth testing and product evaluations, advice, tips expert opinions, and much more! It's ideal for anyone who's evaluating the significance of new technologies . . . doing

research . . . making complex multiplatform purchasing decisions . . . developing the next generation hardware or software products . . . preparing strategic corporate plans.

SELECT ▼

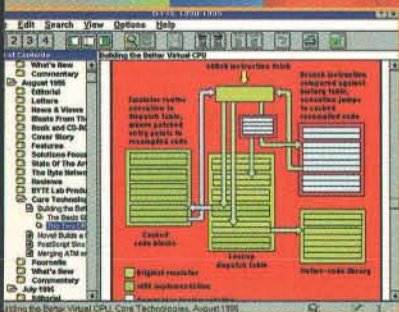
5 Year
1991-

- Product Reviews &
- BYTE Lab/NSTL Reports
- Benchmarks
- Cover Stories & Features

Index to Articles & Full Text Database



LOCATE ▼



SCAN ▼

It's Comprehensive . . . Time Saving . . . and Easy to Use!
It's all in BYTE on CD-ROM

Order Today!

1-800-924-6621

Order Now!

Toll-free national numbers:

Belgium 080071635
Germany 0130826112
U.K. 0800973017
Italy 167876155
France 05916088
Netherlands 05916088
Switzerland 1557257
Denmark 80017728
Sweden 020791136
Spain 900933539

Other
International 091-752792
United States 1-800-924-6621
Fax: 609-426-5434

Yes! I want the power & convenience of BYTE on CD-ROM

- ☐ Send me **Byte on CD-ROM PLUS!** Full text from 1991-1995 issues of BYTE plus quarterly CD-ROM updates with full text and colorful graphics for all the 1996 issues of BYTE for just **\$54.95**.
☐ Send me **BYTE on CD-ROM**. Full text from 1991-1995 issues of BYTE—more than 60 issues for only **\$39.95**.

Charge my: ☐ MasterCard ☐ VISA ☐ Amex ☐ Check enclosed (make checks payable to BYTE magazine, US funds only)

Card# _____ Exp. Date _____ Signature _____

Name _____

Address _____

City _____ State/Country _____ Zip/Postal Code _____

Mail to: **BYTE on CD-ROM**, P.O. Box 526, Hightstown, NJ 08520

P.O. Box 85, Galway, Ireland



Canadian and U.S. orders, please add \$2.95 for shipping and handling, and state sales tax where applicable. (Canadian orders add appropriate GST.) Outside North America, add \$5.00 for air mail delivery. Allow 6-8 weeks for delivery.

A Division of the McGraw-Hill Companies

CDBY096



Back



Forward



Home



Reload



Images



Open



Print



Find



Stop



N

Location: <http://www.bix.com/>[What's New?](#)[What's Cool?](#)[Handbook](#)[Net Search](#)[Net Directory](#)[Software](#)

Global Interactive Community

<http://www.bix.com/>

BIX is owned and operated by [Delphi](#) Internet Services Corporation, along with a staff of experts in technical and recreational computing, philosophy, politics, science, speculation, mathematics, and the arts.

[BIX Masthead](#)

No topic of serious mention is too abstruse or controversial for BIX.
No inquiry is too trivial to deserve a helpful answer.

[Join the BIX Global Community now!](#)

Best of BIX

comes to the Web on October 1st

Best of BIX continues a tradition of wide dissemination of expert technical knowledge for the computer community, but with plenty to offer in other fields. Both technical and everyday topics are full of interesting discussion.

Long-time readers of Byte Magazine will remember "Best of BIX" on the printed page; BIX now brings you the full benefit of hypertext references to selected discussions occurring right now on BIX.

BIX Reports

[BIXreports](#) takes you right to the convention floor.

Conventions reported by BIX recently include:

- [Variety's Showbiz Expo](#)
- [San Diego Comic Book Convention](#)
- [Macworld Expo](#)

Contact: American Power Conversion, West Kingston, RI, (800) 800-4272 or (401) 789-5735; <http://www.apcc.com>.
Circle 1040 on Inquiry Card.

19.2-Kbps Wireless Modem

DESIGNED WITH DIRECT-SEQUENCE SPREAD-spectrum technology, the Hopper DS wireless modem (from \$980) can transmit and receive data at speeds of up to 19.2 Kbps at distances exceeding 6 miles. You can connect the modem to most PCs, programmable logic controllers, or remote terminal units. You can also use the



Hopper DS for point-to-multipoint applications.

Contact: Wi-LAN, Inc., Calgary, Alberta, Canada, (403) 273-9133;
<http://www.wi-lan.com/wilan>.
Circle 1041 on Inquiry Card.

Servers

Windows 3.1-Based Multiuser File Server

A COMBINATION OF HARDWARE AND SOFTWARE, Centralan (including four monitors, under \$7000) lets up to 16 users share a single PC with a 166-MHz Pentium processor, 32 MB of EDO memory (expandable to 192 MB), a multi-VGA adapter, a 2-GB Fast/Wide SCSI-2 hard drive, an eight-speed IDE CD-ROM drive, three internal and four external drive bays, and two 32-bit PCI and five 16-bit ISA expansion slots. Each user needs only a keyboard, mouse, and SVGA monitor at their desktops, which plug into a junction box. Centralan's four-user base system comes installed with a LAN-ready Intel EtherExpress 10/100B network adapter and a 33.6-Kbps

modem. With a separate PC, remote users can access data and run applications the same way they would while in the office.

Contact: AST Research, Inc., Irvine, CA, (800) 876-4278 or (714) 727-4141;
<http://www.ast.com>.
Circle 1042 on Inquiry Card.

Storage

230-MB MO Drive

A BATTERY-POWERED 3½-INCH 230-MB MO drive, Fujitsu's DynaMO 230 Portable PC Card Drive (from \$499) comes with a Type II connector that provides a data transfer rate of up to 1.6 MBps. Compatible with PCs and Macs, the drive has a seek time of less than 65 ms, a rotational speed of 2700 rpm, and a 128-KB cache.

Contact: Fujitsu Computer Products of America, Inc., San Jose, CA, (800) 626-4686 or (708) 432-6333;
<http://www.fcpa.com>.
Circle 1043 on Inquiry Card.

DLT Libraries

THE ENTRY-LEVEL, SCALABLE Q2•15 DLT system can store more than 1 TB of data with 15 cartridges per library storage module. Available in rack-mount, desktop, and desk-side configurations, the Q2•15 (with two DLT 4000 drives, \$22,000) features one or two DLT 2000XT, 4000, or 7000 drives; an integrated bar code reader; and a removable 10-cartridge magazine. The system supports leading software backup and HSM applications running under Novell NetWare, Windows NT, and Unix.

Contact: Breece Hill Technologies, Inc., Boulder,



CO, (800) 941-0550 or (303) 449-2673;
<http://www.breecehill.com>.
Circle 1044 on Inquiry Card.

Systems

120-/133-MHz Pentium Notebooks

THE TRAVELMATE 6020 (ABOUT \$4199) and 6030 (about \$4999) incorporate Intel 120- and 133-MHz Pentium processors, 256 KB of L2 cache memory, 8 and 16 MB of EDO memory, ZPV technology, a six-speed CD-ROM drive, 16-bit full-duplex audio, a 28.8-Kbps modem, and a removable hard drive (1.08 GB on



the 6020 and 1.35 GB on the 6030). The TravelMate 6020 comes with an 11.3-inch TFT display, and the TravelMate 6030 comes with a 12.1-inch 800- by 600-pixel active-matrix SVGA TFT display.

Contact: Texas Instruments, Inc., Temple, TX, (800) 848-3927 or (817) 774-6001;
<http://www.ti.com>.
Circle 1045 on Inquiry Card.

Multimedia Notebook Goes 5 to 10 Hours

WEIGHING 7 POUNDS, THE ACERNOTE Nuovo (about \$3499 to \$3999) features an Intel 133-MHz Pentium processor; 16 MB of EDO memory, upgradable to 64 MB; 256 KB of second-level cache memory; 2 MB of EDO video memory; a 1.2-GB EIDE hard drive; a 128-bit Neo-Magic graphics accelerator, which provides 16-million-color, full-motion video playback and full-color MPEG at 32 fps; an Ethernet controller with an RJ-45 jack; an 11.8-inch active-matrix or 11.3-inch dual-scan screen; a microphone; a 16-bit stereo audio sys-

tem; a 28.8-Kbps fax/data modem with DSV; a touchpad; and a palm rest. The Nuovo also offers two Type II/one Type III PC Card slots and a module bay for a six-speed CD-ROM drive or floppy drive. When you combine it with the AcerDock III, the notebook offers warm-docking connectivity to peripherals.

Contact: Acer America Corp., San Jose, CA, (800) 733-2237 or (408) 432-6200;
<http://www.acer.com/acc/>.
Circle 1051 on Inquiry Card.

Three Pentium Notebooks

THE MONTE CARLO (ABOUT \$3199 TO \$5199) comes with a 100-, 120-, or 133-MHz Pentium processor; a 12.1- or 11.3-inch SVGA active-matrix color display with a resolution of 800 by 600 pixels; 8 or 16 MB of RAM, expandable to 40 or 48 MB; an 810-MB or 1-GB hard drive; a removable 3½-inch floppy drive; a six-speed CD-ROM drive; stereo speakers and a microphone; MPEG-1 video-acceleration support; and an ErgoTrac pointing device. Besides bridge-battery technology for warm-swapping of batteries, the



Milan (about \$2199 to \$4599) features the same Pentium options, RAM, and hard drive as the Monte Carlo, with a 10.4-inch SVGA active-matrix or dual-scan color display or an 11.3-inch SVGA active-matrix color display. The Montego (\$3199) offers a removable 3½-inch floppy drive, plus a 100-MHz Pentium processor; a 10.4-inch SVGA active-matrix color display; 8 MB of RAM, expandable to 40 MB; and a 1-GB hard drive.

Contact: Fujitsu PC Corp., Milpitas, CA, (888) 466-8434 or (408) 935-8800;
<http://www.fujitsu-pc.com>.
Circle 1046 on Inquiry Card.

Beyond the Bouncing Heads

Use JFactory to quickly assemble Java applications.

By Rick Grehan

The quantity of new Java products that arrives daily at BYTE is unnerving. The number of new Java books alone is such that I'm pretty sure the delivery people will soon be unloading them with snow shovels.

Consequently, the Java signal-to-noise ratio is very low; the job of sifting wheat from chaff is difficult. Many of us are still working through the source code for the bouncing-heads demo. There's nothing wrong with that; I'm guilty of it myself. You have to start somewhere.

But once you've got those heads figured out, you should turn your attention to a pair of seriously good Java program jump-starters from Rogue Wave Software. A purveyor of C++ class libraries, Rogue Wave now also offers JFactory, a user-interface development environment for Java. (At the time of this writing, a beta version of JFactory with a 30-day usage limit was available for downloading from <http://www.roguewave.com>. Be warned, however; the file is over 3 MB.)

JFactory looks with longing eyes toward Visual Basic (VB). The act of creating an application (or applet) within JFactory proceeds along the same lines as building a VB program. You start out guided by what amounts to a wizard, which builds for you an empty window (or form, or frame, whichever term you feel comfortable using). A tool palette appears, and, by selecting items from that palette, you populate the window with scroll bars, text boxes, buttons, and other elements. When you click on a visual object, the object-manager window opens, revealing that object's associated properties and events. Sound familiar? If you're a VB programmer, it should.

All the while, JFactory is conjuring source code, waiting for you to pick the Generate menu selection so that it can

pour that source into a file for you. And in the resourceless world of Java, the amount of source code that must be produced (and ultimately executed) to create those visual objects will amaze you. Hence, JFactory does you a big favor.

Iterative development is particularly important in user-interface design. You want to be able to add a toolbar and see immediately what it looks like in the final application or be able to associate a series of buttons with the opening of various dialog boxes and quickly confirm that each button leads to the intended dialog box. JFactory permits code-and-test work with its Test Interface capability. Once you've got a rudimentary user interface clicked-and-dragged together, you then select Test Interface from the Project menu, and JFactory simulates the action of the interface.

This simulation goes quite far. For example, JFactory's image-loop visual object accepts as properties the path name to a starting GIF file and the number of images in the loop. If the first GIF file's name is PICT1.GIF, and if the number of images selected is four, then the image-loop object knows to load the series of files PICT1.GIF, PICT2.GIF, PICT3.GIF, and PICT4.GIF. Once the image-loop object is instantiated and added as a mem-



another little dark cloud forms over the Java-performance landscape.

Also available from Rogue Wave is a suite of three Java packages: Jtools, Jwidgets, and Jmoney. Collectively, these packages are called JLibraries. (A subset of Jwidgets is included with JFactory.) Jtools is a collection of well-reasoned interfaces and classes. These include container classes for objects such as binary trees, B-trees, bags, collections, and the like. It also includes a regular-expression-handling class, as well as a set of classes that format text and numerics for output. (The latter is a real blessing if you have grown weary of coping with the paucity of `System.out.println()`.)

JFactory is available for Windows NT and 95. Both JFactory and Jtools need at least the version 1.0.2 release of the Java developer's kit (available from <http://www.javasoft.com>). JLibraries and a single-user license for JFactory each cost \$195. The individual packages within JLibraries cost \$99 each. Rogue Wave also provides annual support and upgrade contracts, as well as site licenses. **B**

Rick Grehan is a senior technical editor for BYTE reviews. You can reach him by sending e-mail to rick_g@bix.com.

WHERE TO FIND

Rogue Wave Software
(541) 754-3010
<http://www.roguewave.com>

ber of a window's or dialog box's components, it immediately begins playing those images as frames in a moving picture. JFactory's Test Interface selection provides full image-loop automation.

Ironically, the simulation of an image loop goes faster than the actual execution of that same loop in Java. And thus

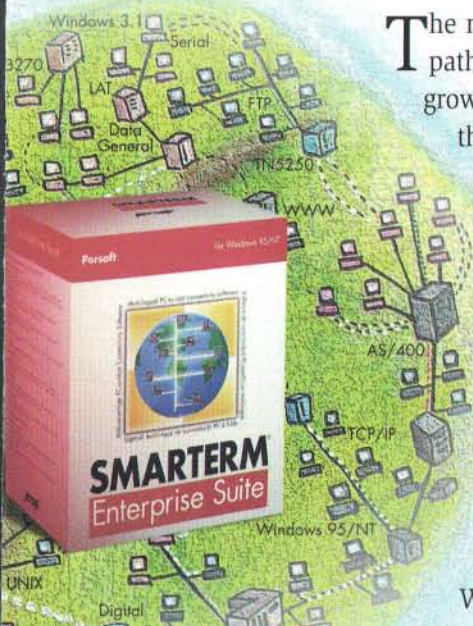
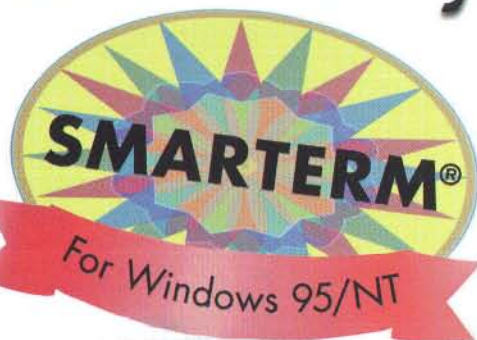
Smart Routes to Connectivity

The number of PC connectivity paths in your organization has grown. Your users want to connect their PCs to the Internet, to hosts around the world, and to X clients. Mapping out these routes requires the best PC-to-host connectivity software available—SmarTerm®.

SmarTerm crosses all the boundaries, taking Windows 95, Windows NT, and Windows 3.1 users to the information they need, no matter where it is. Whether valuable data is on their favorite web sites, X clients on their local UNIX host, a remote AS/400 host overseas, an IBM mainframe in the corporate office, a Digital host at a regional branch, or a Data General host anywhere, your users can extend the reach of their PCs.

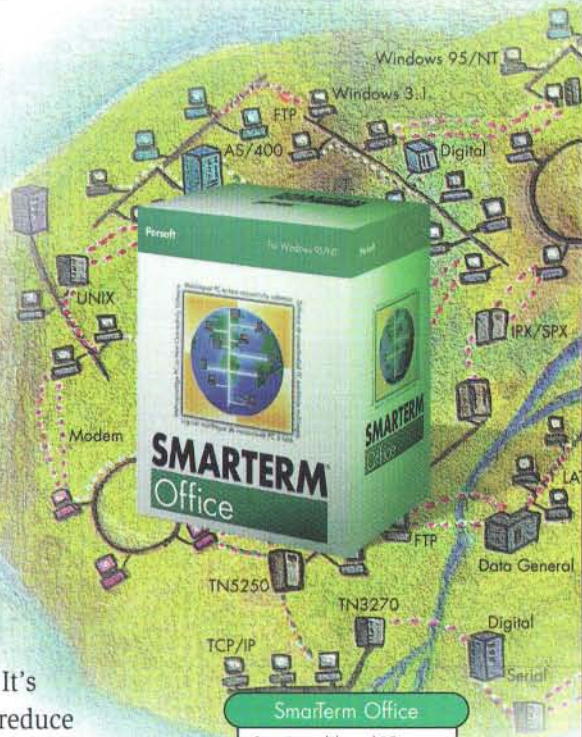
SmarTerm makes efficient, reliable and quick connections. It's designed specifically to reduce your training and support burden by including tools and utilities that automate common activities and integrate host and PC data. Plus SmarTerm is easy to learn and use, and the technical support is free!

Plot your connectivity course today! Call Persoft for a free evaluation copy of SmarTerm for Windows 3.1 or Windows 95/NT: 1-800-TCP-3130.



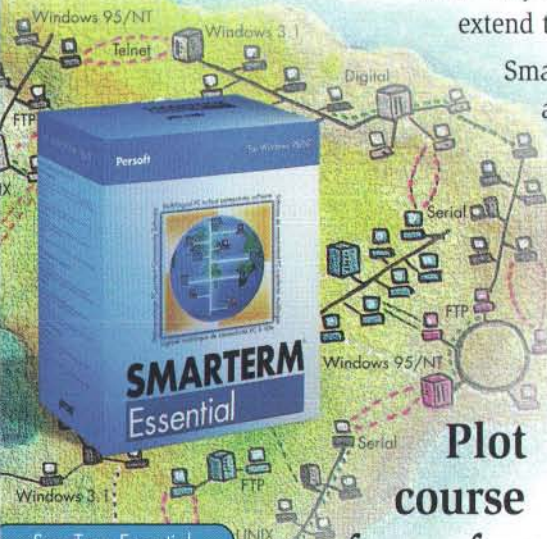
SmarTerm Enterprise Suite

The most complete multilingual connectivity suite offering a PC X server, Netscape Navigator™, and multivendor host connectivity including TN5250, TN3270, VT420, and DG D470.



SmarTerm Office

Superior multilingual PC connectivity for the corporate user who needs multivendor host connectivity including TN5250, TN3270, VT420, and DG D470.



SmarTerm Essential

A cost-effective multilingual connectivity solution for enhanced telnet, FTP, and serial support for corporate users.



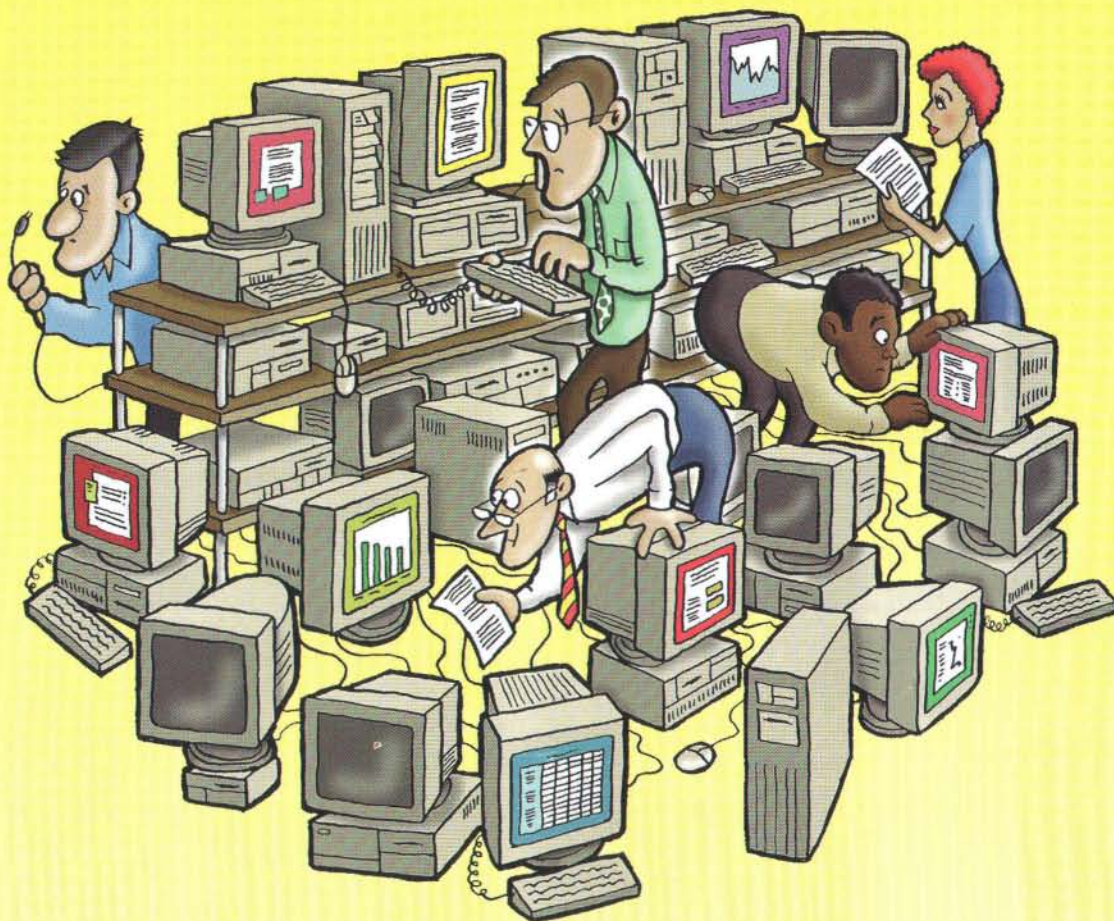
SmarTerm provides simultaneous access routes to the information you need—whether it's on the Internet, in X applications, or on UNIX, IBM, Digital, and Data General hosts.

persoft®

Persoft, Inc., 465 Science Dr., P.O. Box 44953, Madison, Wisconsin 53744-4953 U.S.A.
Phone (608)273-6000, Fax (608)273-8227, 1-800-368-5283, or sales@persoft.com
World Wide Web www.persoft.com, Faxback (608)273-6090

Persoft Inc, European Headquarters, Lower Woodend Barns, Fawley, Henley-on-Thames, Oxfordshire, RG9 6JF, United Kingdom, Phone +44 (0)1491 638090, Fax +44 (0)1491 638010

Lost in the Maze?



Here's the Way Out.

Our Commander products let you control and operate all of your computers through one keyboard, monitor and mouse. Get rid of all of those costly, space eating peripherals, and suddenly your network isn't quite so scary anymore. And since there's a whole family of Commanders, one is right for you. Whether you need fast, easy, access



to a few PCs, or you manage a multiplatform server room, system control is right at your fingertips. Today's configurations are more challenging than ever - but they shouldn't make you feel like a laboratory experiment! For simple, consolidated control of all your system resources, give us a call.



4912 Research Drive Huntsville, AL 35805 USA
1-800-932-9239 (205) 430-4030 fax
<http://www.cybex.com>



PC is a registered trademark of International Business Machines Corporation. Mac is a registered trademark of Apple Computer, Inc. The Inc.500 logo is a registered trademark of Goldhirsch Group, Inc.. Cybex and Commander are trademarks of Cybex Computer Products Corporation.